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PRIMARY CANCER IN THE UTERUS AND IN THE RECTUM OF THE SAME PATIENT[1]

A Study of Twelve Case Histories

by

Eric Nordlander

The question of the occurrence of multiple primary tumours has long been the object of increasing interest in medical literature and quite naturally so as it is closely related to the great problem of the origin and genesis of tumours. The thorough and detailed investigations in this field during recent years have lead more and more to the abandonment of the EHRLICH theory of the unicentric origin of tumours. In this connection should be kept in mind the common etiological factors which working upon one or a system of organs can cause the development of multiple primary carcinomas as for instance in roentgen and lupus carcinomas, multiple primary cancer on the basis of xeroderma pigmentosum Kaposi, the frequently reported multiple carcinomas of the digestive tract and, most recently, the multiple hepatomas produced experimentally by SASAKI and YOSHIDA by feeding mice o-amido-azotoluol.

Since BILLROTH in 1869 published the first case of a patient with two primary carcinomas, there have appeared in the literature numerous reports of single instances as well as small and large series of multiple tumours, analysed chiefly from a pathological viewpoint. In 1932 WARREN and GATES assembled into one series all the cases of primary multiple tumours which they could find in the literature. The survey included 1,219 cases reported by 430 workers. To these they added

[1] Submitted for publication March 31, 1941.

From the Gynaecology Departement of the Radiumhemmet, Stockholm (Chief: Professor JAMES HEYMAN).

their own 40 cases and subjected to statistical analysis this large series of 1,259 instances of apparently certain multiple primary tumours. They found that multiple malignant tumours made up 1.84 % of the entire tumour material embraced by their report and that multiple carcinoma was encountered at about the same age as was single cancer. Finally they showed that multiple malignant tumours occur more often than would be expected from the point of probability and they believed this depended upon a predisposition or special susceptibility in certain persons. That same year HURT and BRODERS reported 71 cases of multiple malignant tumours, making up 3.4 % of the 2,124 patients who had been treated for cancer at the Mayo Clinic in 1924. They pointed out that in all probability multiplicity occurs oftener than is registered. Two larger series from American clinics were published in 1934, one by SCHREINER and WEHR with 307 cases (2.7 %) of multiple tumours in 11,212 patients with predominantly superficial carcinomas, the other by BUGHER with 30 multiple tumours (3.1 %) in 983 autopsied cases of cancer. Finally in 1936 BURKE submitted a series of 46 multiple tumours (7.8 %) in 583 autopsied instances of cancer, thus presenting the highest published percentage. BURKE points out the sharp standards by which the material was selected and emphasizes that in many cases the multiplicity was first establishable after a detailed microscopic examination of the different organs.

The series of autopsied cases in the European literature show a lower percentage of multiple carcinoma (BILELLO and MONTANINI 0.5 % in 8,024 cases, PUHR 0.3 % in 6,718 cases and GORANOVA and SCHABAD 1.8 % in 6,652 cases).

The studies mentioned contain all conceivable combinations of multiple carcinoma. Despite the fact that cancer in the digestive tract, genital organs and mammary glands is a rather common phenomenon in civilized countries, the occurrence of primary tumours in more than one of these systems in the same patient is remarkably rare. Primary carcinomas in both uterus and rectum are very unusual. In their own series of 40 instances of primary multiple tumours WARREN and GATES encountered in 1,078 autopsies three cases with primary cancer in both uterus and rectum. In his series of 49 multiple primary carcinomas HANLON lists one such case, FRIED contributes one and recently in 1936 KURU reported a successfully operated case of synchronous heteromorphous cancer of rectum and uterus. The writer has been unable to discover any more examples in the available literature.

During the 25 year period 1914—1938 the gynaecology department of the Radiumhemmet has treated 4,410 patients with uterine carcinoma. In 73 (1.7 %) of these cases cancer has also been discovered in some other organ. The location of these tumours was as follows:

Site	Number of cases	
Trachea	1	
Lingua	2	
Gingiva	1	
Hypopharynx	1	
Oesophagus	1	
Stomach	7	
Bile ducts	1	
Colon	9	(2 of these in the caecum)
Rectum	10	
Os zygomaticum	1	
Vulva	1	
Ovary	5	
Mammary gland	29	
Skin	4	
Total	73	

Thus in no less than 10 cases has it been possible to demonstrate microscopically the presence of cancer in both uterus and rectum. The circumstance that such a relatively large number of patients was discovered to have this combination of tumours would seem to be explainable on the basis of the regular control examinations each of which included vaginal and rectal palpation. The majority of the cases have been encountered during the last ten year period which is at least partly due to the increase in the number of new patients coming to the clinic with uterine cancer (from 26 instances in 1914 to 411 in 1938). Another contributory factor is the influence of the treatment on the material. With each year there is an increase in the number of patients who have been successfully treated for the uterine cancer and who have arrived at an age where rectal cancer is more frequent.

As to the cause of the development of multiple malignant tumours we know just as little as in regard to the genesis of solitary tumours. The possibility that a previous irradiation could stimulate the development of malignant tumours has been suggested by several workers. In the material here in question the primary irradiation has been directed as a rule toward the uterine tumour only. There had been no previous irradiation in two of the submitted cases where the tumour in the rectum was the first growth to be observed and in case 10 where the tumours appeared synchronously. In the remaining cases it may be conceivable that the irradiation could have contributed to the development of the rectal tumour, especially as the rectal mucous membrane is very sensitive to such rays. This sensitivity is illustrated by the fact that rectal lesions are fairly common after intrauterine and vaginal application of radium, reaching a proportion of 8.5 % in the Radiumhemmet material if the very mildest are included (according to a statistical analysis of Dr. INGEL-

MANN-SUNDBERG, not yet published). It is of interest however that no rectal post-radiation injury could be observed in any of the cases here in question. Thus in these patients the rectal tumour has not developed on the basis of radiation injury. A point against the radiation treatment as an etiological factor in the origin of rectal tumours is the circumstance that the rectal cancer in only a few cases appeared on the part of the anterior rectal wall where the radiation injuries are ususally situated.

The ascertainment of the presence of cancer in both uterus and rectum of the same patient raises the question of whether the method of extension of rectal or uterine cancer favours the development of metastatic tumour in the adjacent organ.

Rectal cancer spreads in three different ways, that is, via the lymphatic system, by direct infiltrative growth and also via the venous system.

The lymph vessels arise in the rectal mucosa as capillaries around the glands around the fundus of which they form a fine network which is connected with the larger lymphatic plexus of the submucosa. From here the lymph is passed to the different lymphatic trunks. Aside from the pars analis whose lymph vessels inferiorly pass to the superficial lymph nodes, there are no less than eight different drainage pathways for the lymph of the rectum (according to the classical studies of BERTELS, GEROTA and others). In brief it may be said that the lymph of the rectum empties chiefly superiorly and posteriorly via lymphatics along the haemorrhoidal and sacral vessels into the lymph nodes beside the large pelvic vessels, into the mesosigmoideum and finally into the lymph nodes along the aorta. Only two small passages have been demonstrated for drainage anteriorly. From the middle portion of the lateral wall of the rectal ampulla pass a number of lymph vessels to the nodes along the adjacent inferior vesicular artery. From the anterior wall of the ampulla lymphatics pass in the connective tissue between the vagina and rectum along the vaginal wall at the level of the excavatio rectouterina to the lymph nodes beside the obturator nerve via the adnexal lymph nodes. In the anatomical papers just referred to there is no mention of any direct lymphatic pathway from the rectum to the uterus.

The extension of rectal cancer through the lymphatics takes place while the tumour clinically is still in a very early stage of development. In a study of the extension of rectal cancer WESTHUES has used a special technique and microscopic examination of the operative specimen and has been able to demonstrate numerous cancer foci as small or even smaller than the head of a pin. The metastases appear first of all in the ischiorectal fat, in the levator musculature, on the peritoneum and in

the mesocolon within the pelvis. Any metastatic extension to the uterus has never been demonstrabie.

When a rectal cancer involves the uterus by direct extension, the cancer is usually in a clinically advanced stage.

The veins like the lymphatics arise in the mucosa under the epithelium and between the glands, pass into the submucosa and muscularis and empty into the haemorrhoidal plexus which can carry the blood further in different directions. The superior haemorrhoidal vein passes first to the inferior mesenteric vein which empties into the portal vein. Another path leads the blood from the haemorrhoidal plexus via the common pudendal, hypogastric and common iliac veins to the vena cava. These connections provide possibilities of extension of a rectal tumour to various other areas including the uterus. The entrance into the blood stream can take place within the tumour area or in its immediate vicinity. In direct extension this generally occurs in the later stages of rectal cancer and then the malignant cells usually pass to the liver or lungs and from there to the parenchymal organs and skeleton. Nevertheless early metastases are encountered in cases where the rectal cancer is small and producing no symptoms. Thus HENKE has described cerebellar metastases as the first symptom in a patient with rectal carcinoma.

The spread of uterine carcinoma varies according to the primary anatomical situation and takes place chiefly by way of the lymphatics, by direct infiltrative growth or by way of the blood vessels. To these may be added the possibility of contact and implantation metastasis, a method of extension which however could scarcely come in question in the discussion of the eventual connection between a uterine carcinoma and a later developing rectal cancer.

The lymph vessels in the uterus form a plexus in the mucosa as well as in the subserous connective tissue and empty themselves through large trunks provided with valves. Within the uterine wall the lymphatic paths converge in the inferior and larger section of the corpus and in the collum into a common main trunk in the region of the uterine artery, proceed then with this vessel in the parametrium nearby or into the parametrial nodes to the lymph nodes along the vascular trunks (lymphoglandulae iliacae inferiores, hypogastricae, sacrales and then iliacae superiores and lumbales), while the lymphatics from the upper smaller section of the corpus leave the uterus beneath the cornu, pass along the tube and the vasa spermatica superiorly into the lumbar nodes and then on into the cisterna chyli and thoracic duct. Investigations of various types have shown that first of all the iliac and hypogastric lymph nodes are involved, then the sacral and lumbar and finally the inguinal and coeliac. Yet as a result of the profuse anastomoses and by

obstruction or other destruction of the normal lymph passages or by the abnormal course of single lymphatics, the lymph nodes which are usually first involved may be skipped or may be involved later. The anastomoses which connect the lymphatic system of the vagina and the vaginal portion of the uterus should here be kept in mind. Of special interest in this connection are the vaginal rectal connections first demonstrated by MORAU and later confirmed by BRUHN and BARTELS. These are two or three lymph vessels from the main trunks in the vagina passing into the rectovaginal septum and from there into a network over the entire anterior wall of the rectum. By injection of rectouterine adhesions both POIRIER and MORAU have likewise been able to demonstrate this netlike extension of lymph vessels on the anterior wall of the rectum indicating that the continuity of the lymphatic paths between the uterus with vagina and the rectum may be retained even under pathological conditions. Thus even if the lymph in the uterus and rectum follows for the most part other pathways, there still remain anatomic possibilities for metastasis in this way. Further support for this view is provided by the clinical observation of metastases in the rectum from primary uterine cancer.

Extension by way of the lymphatics may be direct continuity when the cancer tissues preceeded by an inflammatory edema and consequent lowered resistance grow into the loose tissue and lymphatic spaces and from there follow the lymph pathways or discontinuity with lymphatic metastases separated from the mother tumour by cancer-free tissue.

When a uterine cancer reaches the rectum by direct continuity, it is usually in an advanced stage.

Similarly, hematogenous metastases also appear first in the advanced stages and usually by breakdown into a vein, for the thickwalled arteries are better able to resist the cancer cells. The rich venous plexuses around the uterus with the adnexae and around the bladder and upper portion of the vagina are connected with the venous system of the rectum only through subcutaneous anastomoses at the anal ring. Both the hematogenous and lymphogenous metastases seem to require a certain disposition of tissue.

From what has just been said in regard to the method of spread of rectal and uterine cancer it becomes obvious that the development of metastatic cancer in the adjacent organ does not seem to be especially favoured.

In case of tumours in both uterus and rectum what possibility have we of being able to distinguish between the existence of two primary tumours or a primary tumour and a metastasis? The conclusions must be arrived at on the basis of the clinical course and the histological picture.

As far as the clinical course is considered the first thing to ascertain is whether or not the cancers in the rectum and uterus are actually one and the same tumour which by direct invasion has given rise to what seems to be a primary growth in the other organ. From what has been said in the foregoing in regard to the method of spread of the respective cancers it would seem most necessary to exclude the possibility of a uterine cancer having extended over into the rectum. The site of the rectal tumour and the presence or absence of tumour infiltration in the intermediate tissue layer would seem to be of significance in arriving at a decision. The clinical course provides additional help if the patient has been examined repeatedly and the development of the process has been followed. Another factor of importance in the evaluation is the time interval between the appearance of the two tumours. A long interval suggests rather definitely the presence of a new primary tumour. In this connection there should be mentioned the possibility of very slowly growing primary cancers. Such tumours have been encountered in the collum as well as the corpus uteri in the Radiumhemmet material.

What chance have we of determining histologically whether or not a cancer in the uterus or rectum is primary?

When the entire tumour plus the surrounding tissues are available for examination and when the sections show transitions from normal or pathological mucous membrane to cancer vegetations, it is regarded as convincing evidence that the tumour has arisen in loco. A classical example is provided by a cancerous rectal polyp showing clear transitions from rectal mucous membrane of normal type to polypoid tissue and from this to definite adenocarcinoma. A uterine curetting with particles of tissue torn from their attachment provides much less possibility of diagnosis but even here are sometimes encountered cancer fragments topographically connected with, for instance, a polyp, thus providing evidence of the primary nature of the cancer in the uterus.

The histological structure of the tumour tissue may also serve as an indicator when it is a matter of determining whether a carcinoma has arisen from the mucous membrane of the uterus or intestine. Only however when the carcinoma is particularly highly developed and the cells present a striking similarity to the normal structures in that organ can a definite conclusion be arrived at. On the whole only the highly differentiated adenocarcinomas provide an opportunity in this respect.

Is the one tumour a metastasis of the other? What conclusions may be drawn from the histological findings?

In the event that one of the tumours (uterine or rectal) is to be regarded as undoubtedly primary, the only question is whether the other is a metastasis from this. It is natural that a cancer metastasis cannot

be fitted into the normal tissue structures in the same way as a still early primary tumour and that there can be found only apparent transition pictures where the cancer comes in contact with the normal epithelium or with its so-called collateral proliferations.

In the many cases in which convincing genuine transitions are lacking, one must rely on the histological structure of the tumour tissue. It is scarcely possible to lay down generally applicable rules for diagnosis based only on the histological picture. In each instance it is necessary to arrive at a decision after the two tumours have been carefully studied and the extent of the morphological variations in each of them determined.

In two of the cases in the present series, the tumour in the collum uteri as well as in the rectum was of squamous epithelial character. The carcinomas were so similar microscopically that from a histological standpoint one could easily have been a metastasis of the other.

In three instances both tumours were adenocarcinoma. In two of the cases the adenocarcinomas differed considerably which provides support for the assumption that they were two primary cancers, while in the third case they were apparently alike. In none of these cases was it possible to arrive at a definite decision on the basis of the histological picture alone.

In five of the cases the tumour in the collum uteri was squamous epithelial cancer and in the rectum adenocarcinoma. Theoretically it is conceivable that an adenocarcinoma in which a part of the cells differented to squamous epithelium could give rise to metastases which would look like squamous epithelial cancer. Conversely it is conceivable that a squamous epithelial cancer has the potency to differentiate toward adenocarcinoma and that glandular structures would appear in the metastases. However, such extreme transformations of carcinoma structures are so exceedingly rare that in a concrete case one need scarcely take this remote possibility into consideration. In the five cases here in question no structures were observed which even suggested such a transformation and it would seem justifiable to draw the conclusion that in each instance there were two primary carcinomas.

The carrying out of the present analysis has been greatly facilitated by the clearly arranged, detailed and complete clinical records in the Gynaecology Department of the Radiumhemmet. The writer is deeply indebted to the Chief, Professor JAMES HEYMAN, for access to the material, for kindly interest and for valuable guidance in its analysis.

The histological examination of the tumours has been performed by the chief of the Tumour Pathology Department, Doctor O. REUTERWALL, who has also been kind enough to assist the writer in a review of the sections.

As far as the radiological treatment in the individual case is concerned, it has been carried out in accordance with the current technique at the Radiumhemmet (HEYMAN, Acta radiologica XVI, 2, No. 90).

Case Histories.

A. Cases where the first tumour observed was situated in the rectum.

(Both tumours examined histologically)

Case 1. J. 7173/34. 70 years of age.

Diagnosis: (1) Cancer of the rectum (adenocarcinoma) + (2) cancer of the body of the uterus (adenocarcinoma).

(1) Operated upon March 22, 1932 (Professor KEY) Quenu for a superficial tumour 5 × 6 cm. situated in the anterior rectal wall 8 cm. above the anus with an infiltration metastasis 2 cm. in diameter and lying 3 cm. inferiorly. Postoperative course essentially uncomplicated.

(2) Since May 1933 gradually increasing hemorrhage from the genital tract. Curettage of uterus October 18, 1934: Adenocarcinoma.

Local status: Uterus difficult to palpate and fixed toward the sacrum.

Treatment: Intrauterine and vaginal application of radium November 1, 1934.

Course: Symptom-free until January 11, 1936 when a area of resistance was encountered in the abdomen. Death March 3, 1936. Autopsy refused.

Microscopic examination: (1) Rectal tumour: Highly differentiated adenocarcinoma. Papillary structures. Cancer infiltrating the muscle nearest the mucous membrane. No squamous epithelial differentiation. (2) Uterine tumour: Highly differentiated, partially papillary adenocarcinoma with squamous epithelial differentiation.

Microscopic study of the rectal tumour shows everywhere the picture of a primary rectal carcinoma with border areas containing transition structures from polypoid tissue to this adenocarcinoma.

The papillary uterine carcinoma also shows the picture of a primary tumour with transition structures from corpus polypoid histologically benign tissue to definite adenocarcinoma.

In this case there seems scarcely any doubt of the existence of two primary carcinomas. In the border areas of both tumours there are all transitions from polypoid to adenocarcinomatous tissue. Moreover the adenocarcinoma tissue in the two tumours differs considerably in its microscopic structure.

Case 2. J. 6860/37. 54 years of age.

Diagnosis: (1) Cancer of the rectum (squamous epithelial cancer) + (2) cancer colli uteri (squamous epithelial cancer).

Operated upon June 7, 1934 for uterine myoma, chronic salpingitis and cystocele (Amputatio uteri supravaginalis + Salpingoophorectomia bilateralis + Urethroplastik). Histologically no evidence of cancer.

(1) After $^1/_2$ year of rectal discomfort an ulcerated tumour, about the size of a hen's egg, was discovered just inside the anal sphincter, infiltrating the posterior portion of the rectum.

Operated September 30, 1935 according to Quenu (Dr. GIERTZ).

Uncomplicated healing. March 1938 plastic repair of a stricture arising later in the anus sigmoideus.

(2) After one month of continuous bleeding and foul-smelling discharge, admitted to Radiumhemmet August 17, 1937.

Local status: On the stump of the portio an almost walnutsized, ulcerated collum tumour and one month later two metastases the size of rice kernels on the anterior vaginal wall.

Treatment: August 25, 1937 and September 20, 1937 application of radium to the tumour and to the tumour and metastases. Teleradium treatment of the vulva October 1937.

Course: Symptom-free at last examination September 13, 1940.

Microscopic examination: (1) Rectal tumour: The tumour which forms a large ulcer just inside the anus is a hornifying squamous epithelial cancer. It seems to grow far out into the connective tissue beneath the skin of the anus but not as far as the edges of the resection. The firm mass in the perirectal connective tissue at the side of the lower portion of the ampulla is composed of tumour tissue. In the lymph nodes higher up no cancer was encountered. (2) The collum tumour: Squamous epithelial cancer with large clear cells. Marked hydropic degeneration in the cell nests. Some hornification. Negative for mucus.

The tumours present such great histological similarities that the existance of two primary cancers could not be proven on histological grounds alone.

In the first place it is a question whether a primary cancer could have been present in the uterus amputated supravaginally in 1934. However no cancer was encountered at the histological examination of the uterus and adnexae. A priori it seems improbable that a primary corpus cancer would be of the squamous epithelial type.

Against the assumption of a primary cancer in the rectum might be advanced the fact that the cancer here was of the squamous epithelial variety. The growth however was situated immedialety inside the anal sphincter where occasionally squamous epithelial cancers occur. The tumour in the rectum can scarcely be conceived of as having spread by continuity from a primary portio cancer for it was anatomically confined to the posterior extension of the rectum.

The possibility that the rectal cancer was a metastasis of a primary portio cancer cannot be positively excluded. The collum tumour manifested itself however 2 years later than the rectal tumour and a slowly growing portio cancer ought to have been discovered at the operation in 1934. The course would be more in accordance with the assumption that the portio cancer was a metastasis of the rectal tumour. Against this however is the fact that metastases on the portio would seem to be extremely unusually and as far as is known have never been described. If the cancer in the rectum had extended by continuity on to the genitalia, the vagina and fornices should first have been involved. Nei-

ther was it possible to demonstrate any clinical evidence of direct growth of the rectal cancer from the scar after the rectal amputation or in any other intermediate tissue. Moreover the circumstance that the patient is still symptom-free 3 years after the treatment of the cancer of the portio stump and of the small vaginal metastasis makes it improbable that this was a case of a metastasis or a recurrence of the rectal cancer.

On the basis of the foregoing it must be regarded as most probable that there were two primary squamous cell cancers.

B. Cases where the first tumour to be observed was situated in the uterus.

1. Cases with microscopic diagnoses on both tumours.

Case 3. J. 516/22. 63 years of age.

Diagnosis: (1) Cancer colli uteri (squamous epithelial cancer) + (2) Cancer of the rectum (adenocarcinoma).

(1) Irregular bleeding and slight discharge the last two months.

Local status: The anterior lip of the portio shows an ulcerated somewhat subdivided tumour involving the anterior fornix and adjacent parts of the lateral fornices as well as the left parametrium out to the pelvic wall.

Treatment: Radium in the uterus and vagina July 8 and in the uterus August 3, 1922.

Course: No signs of recurrence or metastases from the uterine cancer during the subsequent 17 years.

(2) After the patient had observed that the stool was bloodstained over several weeks, a tumour the size of a cherry was discovered in the posterior rectal wall 2 cm. inside the anal sphincter November 4, 1938.

Operation November 21, 1938. Coagulation of the rectal tumour with the platinum electrode (Professor BERVEN). Radical operation seemed counterindicated in view of the patients 79 years.

On examination March 17, 1939 there was slight insufficiency of the anal sphincter but the patient was otherwise subjectively and objectively symptom-free. Death February 19, 1940 of cachexia after several months of cystitis during which the rectal cancer extended over to the bladder and caused perforation.

Microscopic examination: (1) Biopsy on the collum tumour: Squamous epithelial cancer. (2) Biopsy on the rectal tumour: Adenocarcinoma, rather highly differentiated. Staining for mucus positive.

In this case it must be assumed that there were two primary carcinomas. The interval between the clinical manifestation of the two tumours is 16 years, in addition to which the tumours show essentially different histological structure, the one squamous epithelial in type, the other adenocarcinoma.

Case 4. J. 504/27. 56 years of age.

Diagnosis: (1) Cancer colli uteri (hornifying squamous epithelial cancer) + (2) Cancer of the rectum (squamous epithelial cancer).

(1) Foul-smelling discharge of 6 months duration, the last 3 months with admixture of blood. Evening pains.

Local status: Portio eroded by a tumour with a fissure-like ulceration extending posteriorly toward the left fornix. Palpated from the rectum the tumour seemed to be about the size of a plum. It infiltrated the left parametrium but did not extend into the pelvic wall. Histologically it showed hornifying squamous epithelial cancer.

Treatment: Intra-uterine and vaginal application of radium January 17 and February 7, 1927.

Course: Subjectively and objectively symptom-free after the radium application until June 1, 1929 when a pea-sized, subepithelial, hard nodule was discovered in the left urethral groove. The nodule was regarded as a metastasis and after intubation with 2 radium needles it diminished in size to finally disappear within 3 months. The patient was symptom-free the subsequent 8 years.

(2) In February 1937 after 2 weeks of rectal discomfort an examination revealed a plum-sized ulcerated tumour in the left anterior rectal wall, surrounded on the right by a subepithelial semilunar infiltration the thickness of a finger.

Histological examination: Squamous epithelial cancer.

Treatment: Teleradium treatment was immediately administered to the anus and April 19, 1937 radium was applied in the rectum after which the tumour at first rapidly diminished in size. Later however it progressed and on examination November 17, 1937 involved the left half of the circumference of the pars analis recti with a deep ulceration in the center and also the rectovaginal septum with ulceration in the vagina. On account of the difficulty with defaecation an anus praeternaturalis was established December 1, 1937. Examination Januari 14, 1938 showed further progression of the tumour with infiltration and fixation deep in towards the ischial tuberosities.

Death December 2, 1938.

Microscopic examination: (1) Biopsy from the portio tumour: Hornifying squamous epithelial cancer. (2) Biopsy from the rectal tumour: Squamous epithelial cancer with some hornification. Part of the cancer lies beneath and within the basal portions of the rectal mucous membrane, and part reaches the surface.

Structurally it resembles the preceeding cancer.

Whether the rectal tumour is primary or a metastasis from the portio tumour cannot be decided microscopically.

Clinically the rectal tumour resembles most a primary rectal cancer. The long 10 year interval between the demonstration of the respective tumours makes it perhaps less probable that the rectal tumour is a metastasis of the portio tumour.

A positive conclusion is scarcely possible in this case.

Case 5. J. 5900/31. 46 years.

Diagnosis: (1) Cancer coli op. (adenocarcinoma) + (2) Cancer colli uteri (adenocarcinoma) + (3) Cancer recti (adenocarcinoma).

(1) After 2 years of stomach trouble with loss of weight operation February 26, 1924 (Professor SÖDERLUND) for a tumour the size of a hen's egg in the right half of the transverse colon. Intestinal resection with end to end reunion was done and a prophylactic caecal fistula was made. Uneventful recovery. Histological examination showed adenocarcinoma.

(2) Bleeding from the genital tract of six months duration. After curettage, total extirpation of uterus and adnexa August 7, 1931 in Karlstad Hospital (Dr. ÖRSTRÖM). Histological examination showed adenocarcinoma.

Treatment: Postoperative roentgen treatment of the parametria.

Course: No evidence of local recurrence of the uterine cancer at the last examination October 13, 1938.

(3) On examination September 3, 1932 a pea-sized, pedunculated soft polyp was palpated in the anterior rectal wall a finger's breadth superiorly and somewhat to the right. Unchanged on occasion of 6 later examinations up to September 12, 1935. On next examination November 10, 1936 a soft spongy tumour the size of a hazel nut was discovered in the center of the anterior rectal wall 2 to 3 cm. above the anus. The patient had then had several small hemorrhages from the intestine during the preceding 2 months.

Operation November 24, 1936. Extirpation of the rectum according to Quenu (Professor HYBBINETTE). Witzel's fistula on loop of dilated small intestine November 1930. Suture of fistula December 9. Resection of decimeter portion of small intestine at site of fistula with end to end suture December 15, Healed January 9, 1937.

After operation for the rectal carcinoma examined only October 13, 1938 and found to be on the whole in good condition.

Macroscopic examination: (1) The operative specimen of resected intestine is no longer available for re-study. (2) Operative specimen from the total extirpation of uterus and adnexa: The uterus is 8 cm. long and $5^1/_2$ cm. wide. The wall of the corpus is 2 cm. thick and the cervix $1^1/_2$ cm. The adnexae show no macroscopic abnormality. The cavity of the corpus scarcely admits the little finger and the surface is fairly smooth. In the cervix extending up to 3 cm. from the external orifice of the uterus and down to $1^1/_2$ cm. from it is an ulceration the size ot a bean with papillary excrescences on the surface. Macroscopically the wall here to a depth of $^1/_2$ cm. from the outer surface is composed of a whitish friable tissue. Otherwise the uterine wall is grossly free from tumour infiltration. (3) Examination of the operative specimen from the rectal extirpation: Scarcely 3 cm. from the anus in the rectum is a disc-like ulcerated tumour $1.5 + 1.5$ cm. in size. On the cut surface it does not seem to infiltrate deeper than the surrounding mucous membrane.

Microscopic examination: (2) The material from the curettages and operative specimen shows adenocarcinoma and solid cancer. Here and there a suggestion of differentiation toward squamous epithelium, here and there mucicarminophile substance in the lumina and in the cancer cells. The tumour tissue invades the cervical wall to a depth of about 2 mm. from the outer surface. (3) The rectal tumour is a superficially growing, rather highly differentiated adenocarcinoma with quite profuse production of mucus and with infiltration of only the muscularis mucosa and the most adjacent parts of the mucosa. No metastases in the lymph nodes.

No microscopic preparation of the tumour from the colon has been saved so that it is not possible to determine whether this adenocarcinoma structurally resembled the later tumours in the uterus and rectum. In view of the clinical course the colonic tumour could scarcely have been of any significance in the development of the latter tumours and the problem is in this connection of more subordinate importance as the main interest attaches itself to the question of the mutual relation between the tumour in the uterus and the one in the rectum.

The clinical course provides evidence against the possibility that the uterine cancer could be a metastasis from the rectal tumour: Symptoms of rectal cancer did not set in until more than 5 years after the operative removal of the rather advanced uterine tumour with a bean-sized ul-

ceration and tumour tissue growing in the cervical wall. Were the rectal cancer the mother tumour, it would probably earlier have assumed larger proportions in relation to its supposed metastasis in the uterus. Furthermore the microscopic picture is against such an assumption. In the curettings from the uterus there are areas showing transitions from almost normal mucous membrane to highly differentiated parts of the adenocarcinoma thus indicating that the uterine carcinoma is a primary tumour.

In regard to the possibility that the rectal cancer could be a metastasis from the uterine tumour, this seems clinically rather improbable, not merely on account of the time interval in question but also on the basis of the clinical observations. In all probability the rectal tumour would seem to have developed in the previously observed polyp which became malignant after a stationary and clinically benign period of three years under observation. Pathologists (ASHHOFF, KAUFMANN OBERNDORFER) as well as clinicians (REICHEL, SCHMIEDEN, WESTHUES) have demonstrated the great rôle which mucous membrane polyps can play in the development of cancer in this region. The assumption that the rectal tumour was metastatic from the uterine cancer is also very improbable from a histological viewpoint. In certain respects adenocarcinoma in the rectum differs from that in the uterus. The epithelium of the former is highly differentiated and produces rather profuse mucus while that of the latter is generally less differentiated and contains solid areas with a suggestion of squamous epithelial differentiation. Thus the microscopic pictures suggest that the rectal tumour was of a primary nature but they cannot exclude the possibility that it could be a metastasis from the uterus.

A direct extension from the uterus could also be discussed. It seems however highly improbable as in such case there should have been evidence of cancer growth at first in loca and this could not be demonstrated after 5 years of clinical cure. Moreover the superficial position of the tumour in the mucous membrane with the underlying layers intact seems scarcely reconcilable with direct extension. For absolute proof of this point it would be necessary to have serial sections of the tissues between the two cancer tumours and establishment of the absence in every section of any connecting bridges of cancer tissue.

From the above it becomes obvious that clinically and histologically everything is in favour of but nothing against the assumption that this is a case with a primary cancer in the uterus and one in the rectum.

Case 6. J. 5460/34. 63 years of age.

Diagnosis: (1) Cancer colli uteri (squamous epithelial cancer) + (2) Cancer recti (adenocarcinoma).

(1) During the last 3 months, profuse blood-stained, foul-smelling discharge. Loss of weight.

Local status: A crater about 5 cm. in diameter situated in the vault of the vagina and a nodular hard tumour strand extending from pelvic wall to pelvic wall.

Treatment: Intra-uterine and vaginal application of radium in two seances in July and August 1934. Roentgen radiation of the parametria.

Course: Primarily clinically healed when examined June 25, 1935.

(2) Occasional blood staining of the stool for many years. On examination March 8, 1938 a bean-sized, papillary, ulcerated tumour high up on the right in the rectum.

Operation March 23 with colostomy of the sigmoid loop and May 9, 1938 according to Quenu (Dr. NORMANN).

Death following operation May 29, 1938.

Microscopic examination: (1) Biopsy from portio tumour: Squamous epithelial cancer with some hornification. (2) Biopsy from rectal tumour: Higly differentiated papillary adenocarcinoma with production of mucus. Infiltration in the submucosa.

In this case there are undoubtedly two primary tumours. Both the collum cancer with the wide crater at the top of the vagina and the papillary ulcerating rectal growth had the character of primary tumours on the occasion of the clinical examinations. The anatomical situation of the tumours with intact normal tissue between them is evidence against direct invasive extension. It is perhaps conceivable that the beam-sized rectal tumour which appeared almost 4 years later than the collum cancer could be a metastasis of it.

Case 7. J. 714/35. 48 years of age.

Diagnosis: (1) Cancer colli uteri (squamous epithelial cancer) + (2) Cancer recti (adenocarcinoma).

(1) Increasing discharge during the last month.

Local status: Walnut-sized, flat cauliflower tumour on the posterior lip of the cervix extending over onto the posterior fornix. Biopsy October 21, 1935 showed cancer.

Treatment: Intrauterine and vaginal application of radium in two seances. Roentgen radiation of the parametria.

Course: Repeated control examinations showed no signs of recurrence or metastasis from the uterine cancer.

(2) Examination April 20, 1938 revealed a disc-shaped, somewhat papillary, superficial tumour 1.5 cm. in diameter in the anterior right rectal wall about 15 cm. above the anal opening.

Operation May 4, 1938: Colostomy (Prof. STRÖMBECK) and combined abdomino-sacral extirpation of the rectum.

Symptomfree in loco at repeated control examinations until December 2, 1940 when after profuse discharge from the vagina and pains in the back and right leg both cervical lips were found to be as thick as fingers, very firm and nodular. Curettage revealed a pyometra and an irregular tumour in the posterior cervical wall, while the curettings were suggestive of squamous cell cancer. All was indicative of a recurrence of the collum tumour.

Microscopic examination: (1) Biopsy: Squamous epithelial cancer with some hornification and marked nuclear polymorphism. (2) Rectal tumour: Rather highly differen-

tiated adenocarcinoma arising in the rectal mucous membrane. The sections showed only superficial infiltration of the muscularis. No metastases in a couple of small lymph nodes in the subserous fatty tissue. The tumour tissue was completely unlike the previous cancer colli uteri.

In this case there are undoubtedly two primary tumours. The flat cauliflower tumour in the posterior lip of the cervix as well as the disc-shaped somewhat papillomatous superficial tumour in the anterior rectal wall gave the appearance of primary tumours on clinical examination. In the former case it was a question of squamous epithelial cancer with some hornification, in the latter a rather highly differentiated adenocarcinoma which seemed to have arisen from the rectal mucous membrane and to have invaded the muscularis only superficially. The tumour tissues were entirely different in appearance and therefore it would seem impossible that the rectal growth was a metastasis from the collum cancer.

Case 8. J. 2962/36. 70 years of age.

Diagnosis: (1) Cancer corp. et colli uteri (adenocarcinoma) + (2) Polypus recti (with adenocarcinoma).

(1) Irregular bleeding the last 2 months.

Local status: Uterus somewhat enlarged, admitting sound 10 cm. Fractional curettage March 16, 1936: Adenocarcinoma.

Treatment: Intrauterine and vaginal application of radium in 2 seances. Roentgen radiation of the parametria.

Course: On examination April 20, 1938 there was recurrence of the uterine cancer with a firm vaginal metastasis 1 cm. in diameter on the urethral and a large resistant mass from pelvic wall. Within the latter the corpus uteri was palpated the size of a fist March 29, 1939 and the size of a foetal head August 18, 1939 and December 4, 1939. Aching and swelling of the one leg plus profuse sometimes foul-smelling and blood-stained discharges.

(2) Examination January 13, 1938 revealed a cherry-sized polyp with a wide base in the anterior wall of the rectum about 10 cm. above the anal opening (bleeding associated with defaecation the last 2 years).

Extirpation of the polyp and its base by diathermy February 28, 1938 (Dr. Crafoord). Uncomplicated healing. No evidence of recurrence of the rectal tumour.

Death August 31, 1940 after 2 months of downward progress with clinical signs of pulmonary and cerebral metastases (paralysis in the right arm and disturbance of speech). No autopsy.

Microscopic examination: (1) Curettings: The tissue from the cervix, fundus and corpus shows adenocarcinoma with little differentiation and rather widespread solid areas. The tissue from the cervix shows loosely distributed small tumour particles but no infiltrative growth. No squamous cell differentiation. Stain for mucus positive. The adenocarcinoma in the curetting has the appearance of a primary carcinoma of the uterus. (2) Rectal tumour: Development of undoubted cancer in the polyp. No tumour growth in the pedicle.

The adenocarcinoma in the uterus shows the histological features usually found in carcinomas here but there are no transitions from mucous membrane to carcinoma tissue. The adenocarcinoma in the rectal

polyp must be regarded as primary in loco. There are transitions from rectal mucous membrane to benign polypoid tissue to undoubted adenocarcinoma.

Histologically the adenocarcinomas are so similar that the one could well be a metastasis of the other. However for the reasons submitted above, the rectal carcinoma must be interpreted as a primary tumour and not metastatic.

The adenocarcinoma in the uterus on the other hand can hardly be metastatic from the rectal tumour for it became clinically manifest nearly 2 years earlier and the rather small rectal adenocarcinoma can scarcely have been in existances at this time.

Thus for the reasons submitted the two tumours must be regarded as primary.

Case 9. J. 6020/36. 36 years of age.

Diagnosis: (1) Cancer colli uteri (squamous cell cancer) + (2) Cancer recti (adenocarcinoma).

(1) Extremely slight daily hemorrhage from the genital tract the last 4 months.

Local status: Superficial ulceration 1.5 cm. in diameter on the anterior lip of the cervix. Histologically: Squamous epithelial cancer.

Treatment: Intrauterine and vaginal application of radium July 20 and August 10, 1936. Roentgen radiation of the parametria.

Course: No evidence of recurrence or metastasis from uterine cancer.

(2) At the time of the first radium treatment of the collum tumour a pedunculated, pea-sized, soft nodule was observed in the anterior rectal wall 2—3 cm. above the anus. Examination October 27, 1936 revealed in the recto-vaginal septum, just inside the sphincter, a subepithelial, button-like thickness about 1.5 cm. in diameter with a markedly deep retraction of the rectal mucosa there.

Operation February 5, 1937: Excision of the rectal tumour by deathermy.

Microscopic examination: Adenocarcinoma extending to the edge of the extirpated tissue superiorly.

Examination April 6, 1937 revealed a vaguely demarcated nodule 1.5 cm. in diameter and several mm. thick situated in the anterior rectal wall at the site of the old tumour.

Radical operation April 20 and May 7, 1937 (Prof. SÖDERLUND) with amputation of the rectum in two seances. Posterior vaginal wall infiltrated; resection of an area the size of the palm of the hand.

Uneventful postoperative course. Patient subjectively healthy. After repeated control examinations still no recurrence November 19, 1940.

Microscopic examination: (1) Biopsy from the collum tumour: squamous epithelial cancer in an early stage. (2) a. The excised tumour from the rectum: Adenocarcinomatous structures of rather highly differentiated type, in one of the sections apparently arising from the rectal mucous membrane which is there undergoing malignant transformation. There is infiltration of the tumour tissue even beneath intact mucous membrane and through the muscle wall, in some places as far as the edge of the tissue specimen opposite the mucous membrane. Infiltrating adenocarcinoma extends in the muscularis as far as the upper edge of the resection but not to the anal border. Microscopic diagnosis: Adenocarcinoma, clearly arising in the rectal mucous membrane. (2) b. Tis-

sue from the rectal amputation: In the piece from the wall between rectum and vagina are foci of adenocarcinoma. The rectal mucous membrane is infiltrated within a small area while the vaginal mucosa is free. The adenocarcinomatous foci lie for the most part in the part of the wall nearest the rectal mucous membrane and do not anywhere in the sections extend out to the edge of the extirpated tissue. Microscopic diagnosis: Adenocarcinoma.

The collum carcinoma is composed microscopically of a squamous epithelial cancer in an early stage and must be interpreted as primary in loco. In the rectal tumour are structures which indicate that the adenocarcinoma has arisen from the rectal mucous membrane.

Histologically the tumours are so unlike that it would seem justifiable to assume that they were two primary carcinomas.

Case 10. J. 8755/37. 35 years of age.

Diagnosis: (1) Cancer colli uteri (squamous cell carcinoma) + (2) Cancer recti (adenocarcinoma).

(1) Operation according to Sturmdorff November 18, 1937 (Dr. WETTERDAL) because of a history of 2 years of discharge and small hemorrhages; clinically no evidence of erosion of the portio. Microscopic examination of the amputated portio revealed a deep-seated endocervical friable tumour. Microscopic diagnosis: Squamous epithelial cancer.

Treatment: Intrauterine and vaginal application of radium in two seances. Roentgen radiation of the parametria.

Course: No evidence of recurrence or metastasis of the uterine cancer.

(2) Examination December 12, 1937 revealed what seemed to be an ulcer about 2 cm. in diameter situated in the anterior rectal wall somewhat to the left, without any demonstrable connection with the collum. Histologically the biopsy showed adenocarcinoma.

Operation December 29, 1937. Extirpation of the rectal cancer by diathermy (Professor SÖDERLUND). Uneventful recovery. At the latest examination February 19, 1935 no evidence of recurrence of the rectal tumour. (Now living abroad and still in good health according to the last report June 1939).

Microscopic examination: The portio preparation: Squamous epithelial cancer with some hornification chiefly evidenced in the form of epithelial pearls. Most of the examined areas of squamous or cylindrical epithelium show here and there superficially squamous epithelial metaplasia of atypical appearance. (2) The excised rectal tumour: Adenocarcinoma. The rectal surface is ulcerated and the tumour extends down into the superficial portion of the muscularis.

Histologically the squamous cell cancer in the cervix and the adenocarcinoma in the excised rectal tumour are so unlike that they must be regarded as two primary tumours. No transitional structures between the two cancers are to be found.

2. Cases where the microscopic diagnosis could be established for the uterine tumour only.

Case 11. J. 158/15. 49 years of age.

Diagnosis: (1) Cancer colli uteri (squamous cell cancer) + (2) Cancer recti.

(1) A discharge becoming more and more foul-smelling the last 4 months.

Local status: The entire portio is occupied by a tumour about three-finger breadths in width and 4—5 finger-breadths anteriorly posteriorly, reaching almost to the pelvic wall on the left and indefinitely toward the pelvic wall on the right.

Treatment: Intrauterine and vaginal application of radium in 3 seances April—June 1915.

Course: A mild salpingo-oophoritis in connection with the radium treatment. No evidence of recurrence or metastasis of the uterine cancer on the occasion of later examinations.

(2) Control examination February 1929 revealed in the rectum an ulcer as large as the back of a child's palm, with a sharp snout-like border and fixation to the surrounding tissues. Clinically cancer. The patient was referred to the surgical department where the almost fist-sized ulcerated rectal tumour was regarded as inoperable with the result that only colostomy was undertaken as a palliative procedure. After the roentgen treatment the tumour ulcer became cleaner but there was no decrease in size. Increasing cachexia.

Death November 27, 1929.

In view of the long interval of 15 years it would seem justifiable to regard the rectal tumour as primary.

Case 12. J. 986/32. 68 years of age.

Diagnosis: (1) Tumour of the right labium major (malignant?) + (2) Cancer corpus uteri (adenocarcinoma) + (3) Cancer recti.

(1) After 5 weeks of burning on urination examination in August 1927 revealed on the inside of the right labium major a cyanotic unsensitive tumour the size of a hazel-nut kernel and about 1.5 cm. medial to this another similar, red, also unsensitive tumour the size of a cherry pit. These were removed by electrocautery. There was freedom from symptoms until October 1928 when a polypoid proliferation, half the size of a pea, was observed just beside the clitoris. In December 1929 discharge with slight irritation of the mucous membrane of the vulva and a number of small eczematous papules. By December 1930 these papules were found to have grown to the size of a pea dorsally to the clitoris and there were also a number of peculiar reddish ulcerated papules on the right labium major. The lesions were regarded as precancerous. The entire mucous membrane of the vulva was excised January 9, 1931 and the adjacent skin on the right labium major was coagulated electrically (Dr. AHLBOM). Uneventful recovery. No evidence of recurrence of the vulval tumours on the occasion of later examinations.

(2) After 5 months of intermittent small hemorrhages from the narrowed vaginal inlet, the opening was dilated May 31, 1932.

Local status: Normal vagina and a small portio. Uterus somewhat enlarged (admitted a sound 10 cm). Curettage: Histologically adenocarcinoma.

Treatment: Intrauterine application of radium in 2 seances.

Course: Except for the narrowing of the vagina after electrocoagulation, no abnormality was encountered at the control examinations the first 2 years. (3) Examina-

tion September 25, 1934 revealed an area of resistance larger than a hen's egg to the right and above the small uterus. The resistance was thought of as perhaps due to an ovarial metastasis. Exploratory laparotomy October 5, 1934 (Prof. HEYMAN). Uterus small, ovaries atrophic. The tumour which was situated in the rectum about 5—6 cm. above the floor of the pelvis consisted of a 5—6 cm. long circular thickness of the intestine which seemed to be freely movable but may have been fixed slightly inferiorly towards the floor of the pelvis. No lymph node metastases. The tumour was interpreted by the surgeon as a rectal cancer and radical operation was advised but the patient refused. No histological specimen obtained.

In June 1935 the area of resistance was found to be almost as large as an orange and was showing beginning fixation. There was no evidence of recurrence of the uterine cancer. In February 1936 there was beginning cachexia with a fist-sized nodular tumour at the site of the uterus. (Probably the corpus had fused with the intestinal tumour into one mass). In May 1936 the tumour was found to have progressed, to have broken through to the intestine and to have involved the greater portion of the right half of the pelvis. Death July 16, 1936.

Microscopic examination: (1) The vulval tumours: Naevus-like growths with no evidence of malignancy. (2) Curettage from corpus: Adenocarcinoma with some rather highly differentiated areas. In other regions more solid growth with clear cells which in some places suggest squamous epithelial differentiation. When stained for mucus occasional cells and some lumina give a positive reaction with red colour.

Morphologically the corpus carcinoma is very different from the naevogenous tumours which cannot be interpreted as metastases from it. (3) The rectal tumour was not examined microscopically.

In view of the macroscopic appearance of the rectal tumour on exploratory laparotomy, it was probably a primary tumour. The naevogenous tumours in the labium major seemed to be primary in loco. The long interval before the rectal tumour gave symptoms also suggests that it was a primary tumour.

SUMMARY

In a series of 4,410 cases of uterine carcinoma treated at the Gynaecology department of the Radiumhemmet in Stockholm during the 25 year period 1914—1938, the writer reports on 73 cases with cancer in another organ as well. Among these 73 patients, 10 had a microscopically verified carcinoma in both the uterus and the rectum while in 2 additional cases the microscopic examination of the rectal tumour is lacking. The writer is inclined to accredit the relatively large number of cases with this tumour combination to the fact that the patients were subjected to a repeated control including both rectal and vaginal examination. There is apparently no reason to believe that the radiation treatment of the uterine carcinoma should be of any significance with regard to the development of the later arising rectal tumour. Neither does the general way of spreading of rectal or uterine cancer seem to favour especially the development of metastases in the other organ. The writer discusses the possibility of differentiating between primary and metastatic tumours by means of observations as to the clinical course and to the microscopic aspect. A detailed study of the case histories leads the writer to the conclusion that in all cases included in his series there were two primary tumours, one of which arising in the uterus and the other in the rectum.

ZUSAMMENFASSUNG

In der Zeit von 1914—1938 wurden in der Gynäkologischen Klinik des Radiumhemmet in Stockholm 4,410 Patientinnen mit Uteruscarzinom behandelt. In 73 Fällen war ein Carzinom auch in anderen Organen vorhanden. Der Verfasser berichtet über 10 Fälle mit mikroskopisch bestätigtem Carzinom sowohl im Uterus wie im Rectum. Hierzu kommen noch 2 Fälle mit derselben Tumorkombination aber ohne mikroskopische Diagnose für den klinisch diagnostizierten Rectumtumor. Der Verfasser glaubt, dass die relativ grosse Anzahl Fälle mit der obengenannten Tumorkombination in dem Material sich in erster Linie darauf bezieht, dass die Patientinnen regelmässig palpatorisch sowohl per vaginam als auch per rectum nachuntersucht worden sind. Der Verfasser meint, es liege keine Ursache vor anzunehmen, dass die Strahlenbehandlung des Uteruscarzinoms irgendeine Bedeutung für die Entstehung der später auftretenden Rectumtumoren gehabt haben könnte. Auch die Ausbreitungsweise des Uterus- bzw. des Rectumcarzinoms scheint das Auftreten von metastatischem Carzinom in dem anderen Organ nicht besonders zu begünstigen. Nach dem der Verfasser mehrere Möglichkeiten erwähnt hat, aus den klinischen Observationen oder aus dem histologischen Bild die Frage zu lösen, ob es sich um zwei primäre Tumoren oder um die Ausbreitung eines Tumors handelt, wird jeder Fall einzeln von diesen Gesichtspunkten aus diskutiert. Der Verfasser kommt dabei zu dem Schluss, dass wahrscheinlich in sämtlichen Fällen zwei Primärtumoren vorgelegen haben, der eine vom Uterus, der andere vom Rectum ausgehend.

RÉSUMÉ

Sur 4,410 malades atteintes de cancer utérin qui ont été traitées à la clinique gynécologique du Radiumhemmet à Stockholm pendant la période de 25 ans, 1914—1938, on a trouvé 73 cas ayant une tumeur cancéreuse dans un autre organe également. 10 de ces cas avaient des tumeurs cancéreuses vérifiées au microscope aussi bien dans l'uterus que dans le rectum. Dans 2 autres cas présentant la même combinaison de tumeurs la tumeur rectale a été diagnostiquée cliniquement, mais n'a pas été vérifiée au microscope. Le nombre relativement grand de cas présentant cette combinaison de tumeurs trouvé parmi les malades examinées est, d'après l'avis de l'auteur, dû au fait qu'elles ont toutes été soumises à de réguliers examens de contrôle avec palpations per vaginam et per rectum. On n'a aucune raison de supposer que le traitement radiologique des tumeurs utérines a eu de l'influence sur l'apparition des tumeurs rectales survenues ensuite. Il ne semble pas non plus vraisemblable que le mode de propagation du cancer rectal ou uterin a favorisé la naissance d'un cancer métastatique dans l'autre organe. L'auteur signale les possibilités de pouvoir tirer des conclusions des observations cliniques ou de l'examen histologique pour savoir s'il s'agit de deux tumeurs primaires ou d'une tumeur étendue seulement et discute en détail l'histoire de la maladie de chacun de ses cas. Il arrive à la conclusion qu'il y a eu probablement deux tumeurs primaires dans tous les cas présents, l'une ayant son origine dans l'uterus et l'autre dans le rectum.

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FROM THE ROENTGEN DEPARTMENT OF THE SERAPHIMER HOSPITAL, STOCKHOLM
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MYELOGRAPHIC CHANGES IN KYPHOSIS DORSALIS JUVENILIS[1]

by

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»Spätschädigung des Rückenmarks bei Skoliosen» has been earlier well known as a defined clinical condition, especially thanks to JAROSCHY's investigations. That similar symptoms also may present themselves in severe cases of kyphosis would not seem to have appeared in the literature prior to WRETBLAD's publication in 1939. Because of the close similarity in these cases between clinical picture, operative findings and result of operation, whether the symptoms from the spinal cord be due to scoliosis or kyphosis, WRETBLAD suggests the term of »Spätschädigung des Rückenmarks bei Wirbelsäulenverkrümmung» for all these cases. Even if the clinico-neurological picture in conjunction with a severe kyphosis with a certain amount of probability points to the spinal deformity being the cause of the symptoms from the spinal cord, a myelography is nevertheless necessary to exclude or verify with greater certainty the presence of a tumour.

In the myelographic examination of these cases there are two possibilities open to us, viz. the use of a positive or a negative contrast agent. At the Roentgen Department of the Seraphimer Hospital 8 cases with severe kyphosis of the type known as kyphosis dorsalis juvenilis or SCHEUERMANN kyphosis, and with symptoms from the spinal cord have been examined: the first 4 cases were examined with lipiodol, the 2 intermediate both with lipiodol and gas myelography and the 2 latest cases (of 1940) by gas myelography alone. Regarding lipiodol examinations of scoliosis it is stated that as a rule no abnormality can be found in the passage of the lipiodol through the subarachnoidal space. In some cases, however, a retarded passage without any directly demonstrable local hindrance is said to arise and finally in a small number of cases

[1] This study was aided by a grant from the Rockefeller Foundation Fund.

we find a local relative or absolute block (JAROSCHY, ELMSLIE, GROBELSKI, MENARD.) For my own part I have not met with any cases of relative or absolute block in scoliosis. According to WRETBLAD it is supposed to be mainly cases of scoliosis combined with severe kyphosis or cases where a local scoliosis has been present without any corresponding compensatory curvature of the spine that have given rise to spinal cord symptoms. It would also seem to be these cases of scoliosis that produce changes demonstrable by myelography. A regular S-shaped scoliosis without any pronounced local changes or well-marked kyphotic component does not affect the passage of lipiodol. As to the result of myelographic examinations in severe kyphosis without any appreciable scoliosis, there are, on the other hand, as far as I know, no closer data in roentgenological literature.

In two of the six cases of Scheuermann kyphosis with symptoms of injury to the spinal cord, examined with positive contrast agent in the subarachnoidal space, nothing pathological could be found on the passage of lipiodol through this space, neither on screening nor on films taken (1.5—2 cc. contrast agent were used.) One of these cases showed no block on Queckenstedt's test, the other one showed a relative block. In the third case there was a complete Queckenstedt block and a respiratory block (as to this expression vide LAGERGREN) but no obstruction-liquor. In this case no pathological change could be found at the time of examination. In re-examining the pictures now, however, it appears likely, in the light of our later experience, that there did exist some change demonstrable by myelography although at the time it failed to be properly interpreted. There was never, however, any marked retardation of the passage but level with the kyphosis the contrast medium seems to have passed along the sides of the subarachnoidal space. The 3 other cases, which all showed complete Queckenstedt block and respiratory block, besides obstruction-liquor in 2 of them, all presented definite changes on examination with lipiodol. In the case with normal cerebrospinal fluid the lipiodol was stated to pass down without hindrance to the saccus terminalis, with the patient in the supine position and on raising the head end of the table. In the prone position and on raising the foot end of the patient the contrast agent passed upwards as far as the beginning of the most marked bend of the kyphosis but no further. The stoppage had no characteristic appearance; at any rate it gave no indication of the presence of any juxtamedullary tumour. The two other cases showed on the whole similar myelographic changes though these were somewhat more marked in one of them. Even if the lipiodol at the level of the vertex of the kyphosis passed somewhat slower than in the rest of the subarachnoidal space this retardation was nowhere pronounced and was only notice-

Fig. 1. Antero-posterior view showing the passage of lipiodol along the sides of the subarachnoidal space in a case of severe Scheuermann's kyphosis.

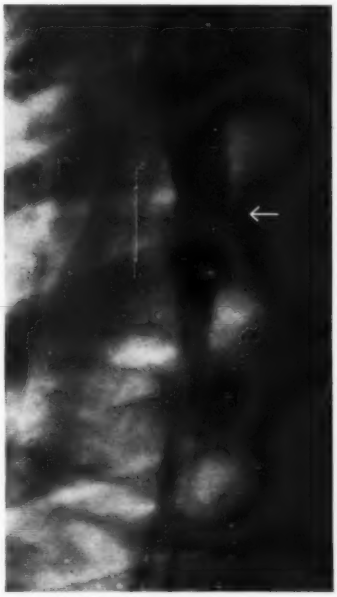

Fig. 2. Lateral view of the same case. The arrow points to the flattening of the subarachnoidal space.

able on screening. On closer analysis however it was found that in the thoracic and lumbar regions the lipiodol could be shifted in the form of a coherent contrast column whereas such was not the case on level with the kyphosis. Here the contrast medium is seen to part into two columns, one on either side of the spinal cord, thus in much the same way as in some cases of intramedullary tumours. In such tumours, however, we find the filling defect occasioned by the spinal cord to be broader; this was not so in the kyphotic cases. Fig. 1 shows an antero-posterior view of this condition in one of the kyphotic cases. A lateral view of the same case (fig. 2) shows flattening of the subarachnoidal space over the kyphosis from behind. Theoretically such flattening might also be caused by an extradural elongated tumour but against this we have the regular outline of the flattening and the absence of a

tumorous border at the beginning of the flattening. An extradural tumour of that size should also have resulted in skeletal changes in the form an enlarged spinal canal. For a proper understanding of the findings of the lipiodol examinations (as also of the gas-myelographic appearance to be described below) it is necessary to be familiar with the anatomical conditions prevaling in a case of severe kyphosis. The operative findings have been similar in all the 6 operated cases out of the total of 8 (the operations were carried out at the neuro-surgical department; Chief: Prof. OLIVECRONA). After laminectomy, which is often hampered by the arches in Scheuermann's kyphoses being generally the seat of an unusual sclerosis of the bone and by the ligamenta flava being largely ossified, the epidural space is seen to be wider than normal. The distance between the arches and the posterior dural layer may be great enough to permit the introduction of a finger below the arches. The subarachnoidal space is more or less compressed, this compression increasing towards the vertex of the kyphosis where the posterior layer of the dura is in direct contact with the spinal cord. The mechanical mode of production of this anatomical condition is explained by WRETBLAD in the following way: the kyphosis causes tension of the posterior dural layer which is drawn forwards towards the vertex of the kyphosis whereby the spinal cord and vessels become compressed against the posterior surface of the vertebral bodies. (The reason why, for instance, the same condition would not arise in severe gibbus formations in cases of tuberculous spondylitis might be that destruction of intervertebral discs and vertebral bodies in these cases shortens the spine and thus prevents any tension of the dura). This anatomical change explains the myelographic findings in these cases. The flattening of the opaque column from behind (fig. 2) is evidently due to tension of the posterior dural layer. Since this dural layer is in direct contact with the spinal cord it naturally follows that the contrast medium in such cases where the kyphosis is sufficiently pronounced and the tension of the dura thus more in evidence is unable to pass between the spinal cord and the dura but is forced out towards the sides as depicted in fig. 1. Here, however, the lipiodol seems to pass without any appreciable retardation of the speed. There is an obvious discrepancy between the lipiodol examinations and the clinical ditto regarding the presence of Queckenstedt's block. The majority of cases have shown a Queckenstedt block. Such want of agreement between a block radiologically demonstrable by lipiodol and a clinical Queckenstedt block is also found however in tumour diagnosis. The contrast agent may sometimes pass obstacles in cases where Queckenstedt-examination has shown a complete block. Probably this has partly to do with a varying amount of swelling and vascular fullness of the canal, partly with the weight of the lipiodol which facil-

itates its passage through narrow channels with perhaps somewhat yielding walls. Above all would the latter factor seem of particular importance in cases of kyphosis in explanation of the insignificant effect here on the passage of the contrast agent.

If we thus summarise the experiences gained from the lipiodol examinations of these 6 cases — with symptoms of injury to the spinal cord in Scheuermann's kyphosis — we find that the contrast examination gave no information of value for the diagnosis in those cases where the compression of the subarachnoidal space, judging by the cerebrospinal fluid findings and the testing for a possible Queckenstedt or respiratory block, was less marked than in the rest of the cases. In 3 (probably 4) cases myelographic changes were present which, when well-established, are of such a nature as to be, in the author's view, quite pathognomonic of the clinical condition in question and which are non-existing in tumour cases. Since, however, the retardation of the passage is but slight or non-existing the changes can readily be overlooked. The myelographic changes occurring in Scheuermann's kyphosis can thus be entirely explained by the tension of the posterior layer of the dura and the actual displacement of the spinal column towards the vertebral bodies. A similar mechanism probably obtains also in other cases of spinal curvatures with myelographic changes. In a regular S-shaped scoliosis the dura is not subjected to any tension since the effect of one curve is counteracted by that of the other one and the passage of the lipiodol is unaffected. In asymmetric curvatures, on the other hand, we get tension of the dura causing compression of the subarachnoidal space and displacement of the spinal cord with consequent myelographic changes.

Since the end of 1937 we have made extensive use of negative contrast media for investigating the subarachnoidal space of the spinal cord. Air and in recent years oxygen gas were at first used more in a tentative manner but have now become the routine method. It is only in exceptional cases that lipiodol is made use of either with the view to checking somewhat doubtful results of gas myelography or where a negative finding on account of the clinical picture seems in need of verification. During 1940 127 gas myelographies were carried out but only 15 examinations with lipiodol. In no case of tumour was there any need of using lipiodol for settling the diagnosis. Our method employed in gas myelography has already earlier been described.

Two cases of kyphosis of the Scheuermann type have been examined both with lipiodol and gas. The changes revealed at the lipiodol examination were too insignificant at the time to allow of any proper judgment. At the gas examination it was found that cerebrospinal fluid could be replaced by gas until about 70 cc. had been injected;

after that no more fluid was obtained. This made it at once clear that the subarachnoidal space of the spinal cord had only incompletely filled up with gas and that therefore some obstruction compressing part of the space must be present. The films taken revealed in both cases that the subarachnoidal space had been filled as far as the lower part of the thoracic spine (vertex of the kyphosis) where it was compressed. To start with there was no air in the lumbar region. Gradually however gas passed down so that a minor gas bubble could be seen in the lumbar region. The pathological change of the subarachnoidal space was thus made much more evident by this method of examination than by lipiodol. In the two cases of Scheuermann's kyphosis examined last year gas myelography alone was carried out. Both cases had a complete Queckenstedt-block without any shut-off liquor. In these cases too the result of examination is the same as in the previous cases. The subarachnoidal space level with the kyphosis is so compressed as to constitute a hindrance for the passage of the gas. This blocking is almost complete but gradually some gas is able to pass. It would seem therefore as if on gas myelography the test for Queckenstedt block and liquor findings yielded much more concordant results than by the lipiodol method. In all cases tested with gas myelography considerable compression of the subarachnoidal space appears at once of such an extent as be well consistent with complete Queckenstedt block. The appearance after a while of a small gas bubble in the lumbar region shows however the presence of some sort of passage which may explain the absence of any obstruction-liquor.

Normally the spinal cord always appears in a gas-myelogram as a band of even thickness in the thoracic region, separated in a lateral picture from the spinal column by the gas-filled subarachnoidal space, a few millimeters in breadth. In cases where the kyphosis is not particularly prominent this space is mainly of the same appearance in different parts of the thoracic region. Experience shows, however, that with more severe degrees of kyphosis the subarachnoidal space takes on different shapes: over the vertex of the kyphosis the space becomes gradually narrower until it entirely fades from view in the radiogram. The subarachnoidal space behind the spinal cord disappears earlier than that in front. This is illustrated in fig. 3, 4 and 5. Fig. 3 is a lateral view of a patient where the kyphosis is little in evidence. It is more marked in fig. 4 and fig. 5 is a view of a Scheuermann kyphosis. This picture shows how the anterior subarachnoidal space gradually becomes narrower until it is completely compressed level with the vertex of the kyphosis. No air is to be seen behind the spinal cord. A tumour constricting the subarachnoidal space produces no such picture as a Scheuermann kyphosis. Fig. 6 is an instance of constriction of the subarachnoidal space

Fig. 3. Normal gas myelography in a patient, aged 20, with a fairly narrow but uniform subarachnoidal space. No kyphosis.

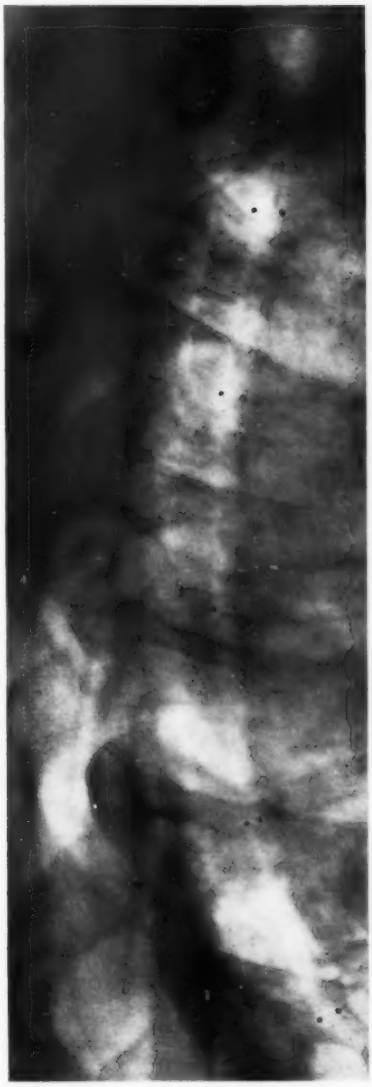

Fig. 4. More severe kyphosis than in the previous case. Over the vertex of the kyphosis the subarachnoidal space is seen to be somewhat narrower than the rest.

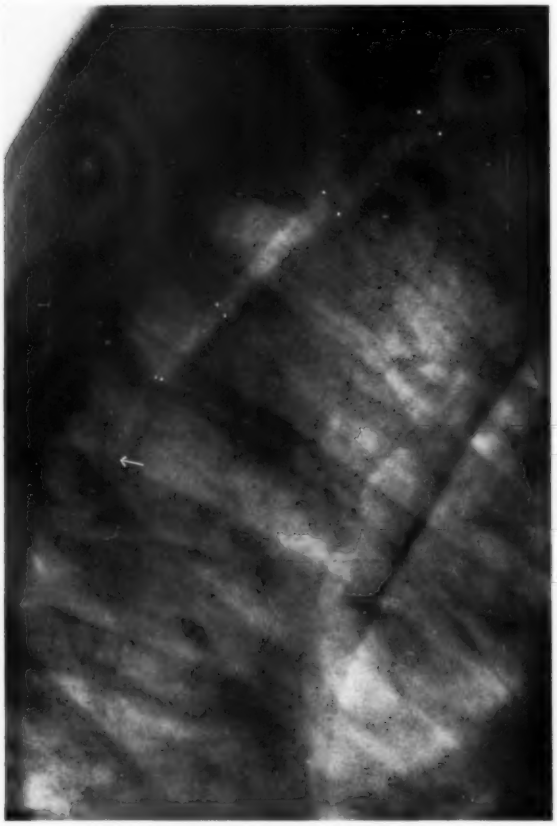

Fig. 5. Scheuermann kyphosis. Gradual narrowing of the gas column in front of the spinal cord as far as the vertex of the kyphosis where the gas ends. No air on the dorsal aspect of the cord.

Fig. 6. Compression of the subarachnoidal space by a juxtamedullary tumour. The spinal cord is displaced forwards. (Compare previous picture).

produced by a juxtamedullary tumour. Here we do not find gradual diminishing of the subarachnoidal space but, instead of having been of regular breadth, it becomes rapidly constricted; this however has nothing to do with an increasing curve of the spinal column.

In summarising the results of the examination with gas myelography we shall find that the gas myelogram affords us a more vivid picture of the anatomical condition of the subarachnoidal space of the spinal cord in kyphosis and that its results tally with the clinical signs of block.

The writer has had the opportunity of examining a fairly severe case of kyphosis due to tuberculous spondylitis with symptoms of compression of the spinal cord. In ordinary cases the destruction of the spine probably counteracts the production of an abnormal tension of the posterior layer of the dura but in the case of no severe destruction there is every chance of getting a spinal cord compression of the same kind as in Scheuermann's kyphosis. In the above mentioned case gas myelography also showed the subarachnoidal space to be altered in the same way as in Scheuermann's kyphosis.

In the foregoing reference has only been made to such myelographic examinations where the contrast agent was injected subarachnoidally. There is yet another method, however, that might be used as a complement to the foregoing, viz. injection of contrast agent into the epidural space. In that case the epidural space is best punctured in the way suggested by DOGLIOTTI (originally used for a method of producing anaesthesia). As contrast medium in all examinations of the epidural space Per-Abrodil should be employed and neither gas nor lipiodol. If air or gas be used there seems to be a risk of contracting air emboli because of the numerous veins located in this space. Per-Abrodil is absorbable, contrary to lipiodol, and only gives rise (if injected in a warm state and in addition to novocain) to some slight rapidly transient pain on injection. After the injection it rapidly spreads over the major part of the epidural space without further measures. The epidural space is widened over the kyphosis opposite the constricted part of the subarachnoidal space.

SUMMARY

The author submits experiences from examining 8 cases of Scheuermann's kyphosis with myelography. In severe cases a positive contrast medium in the subarachnoidal space yields pathognomonic pictures, in less severe cases changes are non-existing or so slight as to be readily overlooked. Gas myelography is a better method; this yields a clearer view of the anatomical condition and the results seem to accord more with clinical tests for the presence of block. The epidural space enlarged over the kyphosis can be demonstrated by injection here of Per-Abrodil.

ZUSAMMENFASSUNG

Der Verfasser berichtet über seine Erfahrungen bei 8 Fällen von Scheuermannscher Kyphosis, welche mittels Myelographie untersucht worden waren. Bei schweren Fällen ermöglicht ein in den Subarachnoidalraum eingeführtes positives Kontrastmittel pathognomonische Bilder, bei leichteren Fällen sind keine Veränderungen vorhanden, oder diese sind so geringfügig, dass sie leicht übersehen werden können. Myelographie mit Gas ist die bessere Methode; mittels dieser bekommt man ein schärferes Bild des anatomischen Zustandes und die Auswertung der Befunde und der klinischen Untersuchung auf Obstruktion scheinen eher übereinzustimmen. Durch Injektion von Per-Abrodil in den Epiduralraum kann dessen Vergrösserung oberhalb der Kyphosis roentgenographisch dargestellt werden.

RÉSUMÉ

L'auteur relate les conclusions tirées de l'examen de 8 cas de kyphosis de Scheumann par la myélographie. Dans les cas graves, un contraste positif a produit au milieu de l'espace subarachnoïdien des images pathognomoniques et, dans les cas moins graves, il ne s'est pas produit de changements sauf peut être des altérations trop faibles pour pouvoir être immédiatement découvertes. La myélographie au gaz est une meilleure méthode. Cette méthode donne des images plus claires des conditions anatomiques et les résultats paraissent mieux s'accorder avec les épreuves cliniques destinées à se rendre compte de la présence des obstructions. L'élargissement de l'espace épidural au dessus de kyphosis peut être decelé par injection de Per-Abrodil.

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AUS DER RÖNTGENABTEILUNG DES KGL. UNIVERSITÄTSKRANKENHAUSES IN UPSALA
(CHEF: PROF. HUGO LAURELL)

EIN FALL VON RÖNTGENDIAGNOSTIZIERTER PRIMÄRER, PARTIELLER APPENDIXINVAGINATION[1]

von

Hans-Gösta Skarby

Bei gewissen Formen von Darminvagination, z. B. der ileozökalen, bildet der Appendix bekanntlich oft einen Teil des Invaginats. Er ist dann meist in dieses hineingezogen, ohne umgestülpt zu sein oder zu werden. Relativ selten findet man bei diesen Darminvaginationen den Appendix teilweise oder ganz umgestülpt, also eine echte Appendixinvagination. In diesen seltenen Fällen dürfte die Appendixinvagination in der Regel sekundär sein, d. h. mit andern Worten durch Hineinziehung des Appendix in das Invaginat entstanden sein (über den Mechanismus hierbei siehe unten). Im folgenden wird unter Appendixinvagination eine Umstülpung des Appendix verstanden, und *nicht* Fälle, wo der Appendix, ohne selbst umgestülpt zu sein, einen Teil des Invaginats bildet.

Eine primäre, partielle oder totale Umstülpung des Appendix (ohne Zusammenhang mit einer andern Darminvagination) ist dagegen, nach den wenigen veröffentlichten Fällen zu urteilen, eine grosse Seltenheit und tritt meist als eine appendicozökale Invagination auf, selten als eine partielle retrograde Appendixinvagination (siehe unten). Eine primäre appendicozökale Invagination kann denkbarerweise leitend für eine Invaginatio coecocolica oder ileocoecalis werden, indem sie nach der Umstülpung anschwillt und deshalb ebenso wie ein gestielter Darmpolyp von der Darmperistaltik erfasst werden kann.

Zu der echten primären Appendixinvagination darf man natürlich nicht die Fälle von lokaler Invagination der Zökalwand in der Umgebung eines angeschwollenen und entzündeten Appendix rechnen, der dabei durch Adhärenzen nach einer früher durchgemachten Entzündung an die Zökalwand gebunden sein kann. Man hat hier eher von einer lateralen Zökuminvagination zu sprechen. Jedoch kann auch eine wirkliche Appendixinvagination bei gangränöser Appendizitis entstehen. Ich hatte Ge-

[1] Der Fall wurde auf der Jahresversammlung des Schwedischen Vereins für Medizinische Radiologie am 3. 12. 1939 mitgeteilt; bei der Red. am 28. 3. 1941 eingegangen.

legenheit, zwei solche Fälle zu operieren. Die Appendixbasis war hier infolge Erigierung und Fixation des Appendix durch Adhärenzen mit der Zökalwand 4—5 mm invaginiert worden. (In solchen Fällen kann man erwarten, dass, wenn der Entzündungszustand ohne Operation zurückgeht, auch die partielle Invagination spontan reponiert wird.) Derartige Fälle sind wohl nicht allzu selten, dürften aber im allgemeinen kein grösseres Interesse auf sich ziehen, da die Appendizitis das Wesentliche im Krankheitsbild ist und die Invagination infolge der Adhärenzen nicht fortschreiten kann.

Die grösste Zusammenstellung echter Appendixinvaginationen, primärer und sekundärer, ist 1922 von SZENES gemacht worden, welcher 55 Fälle beschrieben hat. (Im folgenden wird hauptsächlich seine Arbeit ausführlicher zitiert werden.) Von den genannten Fällen sind jedoch bloss etwa 20 sichere primäre Appendixinvaginationen (weiteres hierüber siehe unten). Ausser den 55 Fällen von SZENES sind einzelne Fälle von BRIN, ESAU, GULLICHSEN, EVANS, BARADULIN und LEDDERHOSE veröffentlicht worden (die drei letzten nach KIRSCHNER). Ich habe in der Literatur keinen Fall gefunden, der durch Röntgenuntersuchung diagnostiziert worden ist.

Vielleicht ist es von Interesse, wenn ich im Zusammenhang mit meinem unten beschriebenen Fall von Appendixinvagination, die röntgenologisch nachgewiesen werden konnte, andere Invaginationen im Verdauungstraktus anführe, die durch Röntgenuntersuchung diagnostiziert wurden, nämlich:

Ventrikelinvaginationen; die zwei ersten Fälle wurden 1932 von LÖNNERBLAD, Upsala, veröffentlicht.

Invaginatio iliaca, erstmalig exakt 1929 diagnostiziert von LAURELL.

Invaginatio ileocoecalis im weiten Sinne mit ihren verschiedenen Varianten ist, soweit ich feststellen konnte, erstmalig von LADD 1913 röntgendiagnostiziert und beschrieben worden, zum zweitenmal von LEHMANN 1914, zum drittenmal von ALTSCHUL 1919 und zum viertenmal von LAURELL 1922.

Reine Coloninvagination; Röntgenbild erstmalig von ZIEGLER u. KAREWSKI 1921 beschrieben.[1] Dieser Typus ist jedoch so ungewöhnlich, dass noch 1938 bloss 9 Fälle mit Röntgen diagnostiziert waren, davon 2 Fälle in Upsala 1932 bzw. 1938 (siehe HOLMGREN).

Praktisch alle Invaginationsformen können also exakt durch Röntgenuntersuchung diagnostiziert werden, gewisse Formen jedoch nur unter einigermassen günstigen Umständen und in der Regel unter der Voraus-

[1] Der Fall wurde jedoch nicht röntgendiagnostiziert, und das Röntgenbild ist allem Anschein nach unrichtig gedeutet (siehe LAURELL, Acta Radiol. XIV, S. 122).

setzung, dass man seine Aufmerksamkeit auf diese Affektionen richtet und die wechselnden Röntgenbilder genau kennt.

Abb. 1.

Der Fall, über den ich hier berichten will, betrifft eine bei der Untersuchung i. J. 1939 68-jährige Witwe, die im Alter von etwa 20 Jahren eine leichte Perityphlitis gehabt haben soll, aber dann vor dem Sommer 1939 nicht an Bauchbeschwerden gelitten hat. Sie begann nun manchmal Schmerzen in der Blinddarmgegend zu haben. Der zugezogene Arzt hatte leichte Ileusanfälle vermutet und wiederholt Blut in den Fäzes nachgewiesen.

Im Juli 1939 wandte sich die Patientin an Dozent HULTEN an der hiesigen Chirurschen Klinik und stand dann einige Zeit unter seiner Beobachtung. Sowohl bei der ersten als bei späteren Untersuchungen i. J. 1939 gab sie an, dass sie hin und wieder *sehr* intensive, bald kolikartige, bald bohrende Schmerzen in der rechten Fossa iliaca habe. Die Schmerzen gingen niemals mit Erbrechen einher. Seit langem litt Pat. an einer chronischen Obstipation. Verdacht auf Harnwegsaffektion (z. B. rechtsseitigen Ureterstein) bestand niemals. Dagegen vermutete man anfangs eine chronische Appendizitis, in zweiter Linie möglicherweise Bauchwandschmerzen (Pat. hatte in der nächst vorhergehenden Zeit einen ziemlich hartnäckigen Husten gehabt) und in letzter Linie einen inzipienten Bruch.

Die erste Röntgenuntersuchung (Ende Juli 1939) erfolgte erst mit Coloneinlauf und etwa einen Tag später mit Darmpassage. Das Colon zeigte keine organischen oder funktionellen Veränderungen. Der Appendix, welcher medial lag und frei beweglich war, füllte sich nur bei der Passageuntersuchung und war 12 Stunden nach der Kontrastmahlzeit gut gefüllt. Sein basaler Teil wies ein merklich verengtes Lumen auf. Der Appendix bot basal ein typisches Bild beginnender Invagination (Abb. 1). Dieses Bild trat bloss bei geeignet abgewogener Kompression auf, so dass der Kontrast im Zökum das Invaginat nicht verdeckte. Man findet auf dem Bild den Appendix ganz oder zum grossen Teil ausgefüllt, mit einem nahe der Basis sehr engen, aber in den übrigen Teilen normalweiten Lumen. Eine distinkte Druckempfindlichkeit konnte diesmal beim Palpieren nicht festgestellt werden, obgleich Pat. mager war und sich daher leicht untersuchen liess. Bei erneuter Röntgenuntersuchung mit Coloneinlauf 10 Tage später fand man indes eine deutlich auf die Appendixbasis lokalisierte Empfindlichkeit und konnte nun in der Appendixgegend eine kleinfingergrosse Resistenz (entsprechend der Empfindlichkeit) tasten. Im übrigen ergab sich nichts Neues. Der Appendix war diesmal sehr unvollständig gefüllt. Man hatte beim Palpieren Darmgurren gehört und wollte sich durch die erneute Röntgenuntersuchung in erster Linie vergewissern, dass keine ileozökale Invagination vorlag.

Noch eine Woche später (15. 8. 39) wurde wegen einer positiven Weberreaktion in wiederholten Fäzesproben eine Röntgenuntersuchung sowohl des Ventrikels und Duodenums als des Dünndarms und der Zökalregion vorgenommen. Man konnte keine organischen Veränderungen im Ventrikel (der eine ausgesprochen hypotonische Form hatte) und im Duodenum nachweisen. Die Dünndarmpassage war normal. Bei dieser Untersuchung war das Bild der Appendixinvagination noch etwas ausgeprägter als früher: nahezu 1.5 cm des Appendix waren invaginiert (Abb. 2 u. 3). Im übrigen war das Bild das gleiche wie bei den früheren Untersuchungen.

Abb. 2.

Abb. 3.

Danach kam Pat. erst Anfang November 1939 wieder. Ihr Zustand hatte sich nun erheblich gebessert, sie hatte an Gewicht zugenommen und keine Schmerzen gehabt. Noch immer war jedoch eine kleine, fingerdicke, empfindliche Resistenz in der Zökalregion tastbar. Um sicher sein zu können, dass kein Krebs bestand, wurde eine neue Colonuntersuchung gemacht; das Colon zeigte keine Veränderungen, das Zökum war wie vorher gesenkt und beweglich. Der Appendix füllte sich nur an der Basis mit Kontrast, wo das Lumen verengt war, aber nun lag keine Invagination vor. Die Röntgendiagnose lautete jetzt: chronische Appendizitis.

Seitdem hat Pat. sich so gesund gefühlt, dass sie keinen Anlass zu haben glaubte, ärztliche Behandlung wegen ihres Bauchleidens nachzusuchen, sondern konnte sich mit Darmdiät praktisch beschwerdenfrei halten. Bloss gelegentlich hat sie Stechen gefühlt, in der Regel bei gewissen Diätabweichungen. Auch das Allgemeinbefinden war ausgezeichnet, und Pat. hat täglich lange Spaziergänge gemacht (nach Angaben von Ende Oktober 1940).[1]

Dass es sich hier um eine partielle Invagination des Appendix gehandelt hat, dürfte ausser Zweifel stehen, obgleich der Fall nicht operiert wurde. Natürlich ist es unmöglich, sich mit Sicherheit über die eigentliche Ursache der Beschwerden zu äussern. Diese waren indes allem Anschein nach in der Zeit, als die ersten Röntgenuntersuchungen stattfanden, bei mehreren Gelegenheiten sehr intensiv. Zwischen den Anfällen, die eine oder mehrere Stunden dauern konnten, war Pat. praktisch beschwerdenfrei. Die Schmerzanfälle gingen gewöhnlich mit leichten Bauchspannungen einher, aber nicht mit Fieber oder Erbrechen. Ebensowenig lagen Urinier-

[1] Die Patientin ist am $^2/_4$ 1941 in Encephalomalacie und doppelseitigen Bronchopneumonien gestorben. Bei der Sektion fand man einige Adherenzen am Colon asc., das hier etwas geknickt war. Appendix frei von Adherenzen, ziemlich dünn mit ziemlich engem Lumen nächst der leicht tritterförmigen Basis. Im übrigen keine Veränderungen im Appendix u. seiner Umgebung.

Das Preparat des Colon asc. und des Zökums nebst dem Appendix wurde mir freundlichst von Herrn Dr. R. Nauclér, Oberarzt am Ersta-Krankenhaus in Stockholm, zur Verfügung gestellt, im dem die Patientin zum letztem Mal behandelt wurde.

beschwerden oder pathologische Harnbefunde vor. Ein Bruch mit gelegentlicher Einklemmung war weder klinisch noch röntgenologisch nachweisbar. Alles dies bewirkte, dass man klinisch anfangs vermutete, dass die Bauchschmerzen auf einer intermittierenden Invagination beruhten oder möglicherweise auf einer chronischen Appendizitis oder leichten Ileusanfällen infolge einer Bride. Die Röntgenuntersuchungen ergaben jedoch keine Anhaltspunkte für Strangulationsileus: die untersten Dünndarmschlingen waren nicht erweitert und füllten sich ziemlich leicht mit Kontrast in retrograder Richtung, und endlich verlief die Dünndarmpassage normal. Ebensowenig konnte man im engen Anschluss an einen heftigen Schmerzanfall eine ileozökale Invagination oder Spuren einer kürzlich durchgemachten feststellen.

Hiernach blieb also bloss der Appendix als nachweisbare Quelle der Beschwerden übrig. Die Röntgenuntersuchung hatte teils eine Invagination seiner Basis, teils eine Verengerung des Lumens nahe der Basis ergeben, und zwar auch bei einer Gelegenheit, als keine Invagination bestand. Ferner hatte man eine variierende Empfindlichkeit über dem Appendix konstatiert.

Pat. hatte also vermutlich eine chronische Appendizitis. Eine solche allein pflegt jedoch selten hochgradige Beschwerden hervorzurufen, jedenfalls nicht so heftige Schmerzanfälle, wie Pat. sie zeitweise hatte. Dagegen hat Szenes bei seiner Zusammenstellung von Appendixinvaginationen gefunden, dass bei diesen äusserst intensive, kurzdauernde, kolikartige Anfälle in der Nabel- oder Appendixgegend typisch sind (siehe unten).

Man kann (nach Szenes) vier verschiedene Typen von Appendixinvagination unterscheiden, nämlich solche, wo:

1) der Appendix in sich selbst invaginiert ist;

2) wo nur der Appendix, ganz oder teilweise, in das Zökum invaginiert ist;

3) wo der Appendix nebst dem der Appendixbasis zunächstliegenden Teil der Zökalwand invaginiert ist (siehe unten);

4) wo eine Appendixinvagination gleichzeitig mit einer grossen Invagination besteht.

In den drei erstgenannten Gruppen ist der Appendix zweifellos das primäre Invaginat. Grössere Schwierigkeiten kann es manchmal bereiten, die primäre Ursache der Appendixinvagination zu ermitteln, wenn eine solche bei einer grossen ileozökalen Invagination angetroffen wird. Von den zu dieser vierten Gruppe gehörenden 28 Fällen (die Mehrzahl sämtlicher Fälle), welche Szenes veröffentlicht hat, dürften wahrscheinlich die meisten anfangs einen anderen Leiter der Invagination gehabt haben als die Appendixbasis.

Eine Invaginatio ileocoecalis beginnt in der Regel nahe der Valvula

ileocoecalis als eine Invaginatio iliaca und wird im weiteren Verlauf gewöhnlich zu einer kurzen Invaginatio ileocolica und schliesslich zu einer Invaginatio ileocoecalis. Während der fortschreitenden Entwicklung (Fig. 4 a—d) wird zuerst das Zökum zwischen das innere und mittlere Darmrohr gezogen und kommt früher oder später nebst dem Appendix ganz in letzteres zu liegen, wird also völlig invaginiert. Durch Strangulation der Gefässe des invaginierten Mesenteriums (und eventuell hinzustossende Entzündung) tritt eine *starke* Anschwellung des Invaginats (nicht zum mindesten die Anschwellung des Mesenteriums pflegt enorm zu sein) und ausserdem eine Exsudation in dessen Peritonealrezess ein. Alles dies, besonders aber die kräftige Peristaltik des äusseren Darmrohrs, die das Invaginat aboralwärts zu schieben sucht, trägt dazu bei, den Zökalpol zu evertieren, der dann in der Regel statt des ursprünglichen Apex invaginati leitend wird (Wickmann, Wilms, Laurell u. a.). Bei dem letztgenannten Teil des Mechanismus wirkt auch mit, dass das Dünndarmmesenterium mit fortschreitender Invagination immer gespannter wird und danach strebt, den ursprünglich invaginierten Dünndarmteil zurückzuhalten. Äusserungen dieser Straffung des Dünndarmmesenteriums findet man in dem nach oben gehobenen medialen Rand des Kragens am Invaginationshals, in dem meist nach der Mesenterialwurzel abbiegenden ursprünglichen Apex invaginati sowie in der hinabgezogenen rechten (eventuell auch linken) Colonflexur. Der Zökalpol (besonders seine Schleimhaut) schwillt nach seiner Umstülpung bedeutend an, teils durch die Strangulation, teils dadurch, dass die Peristaltik des äusseren Darmrohrs das Ödem in aborale Richtung drückt.

Der starke Druck zwischen dem inneren und mittleren Darmrohr, der bei der Umstülpung des Zökalpols mitwirkt, trägt natürlich auch zu einer Umstülpung der Appendixbasis bei. Besonders bei Kindern, wo der fetale, trichterförmige Appendixtypus am gewöhnlichsten ist, ist es verständlich, dass leicht eine mehr oder minder vollständige Umstülpung des Appendix stattfinden kann (siehe Fig. 4 d). Bei einer weit fortgeschrittenen irreponiblen Invaginatio ileocoecalis dürfte deshalb ein partiell evertierter Appendix nicht allzu ungewöhnlich sein, wenn man auch im Resektionspräparat nicht dasselbe Gewicht auf diese Einzelheit legt wie auf andere: Veränderungen der Darmwände, eventuell Tumor usw.

Von den zu dieser vierten Gruppe gehörenden 28 Fällen wiesen 7 eine vollständige Inversion des Appendix auf. In einem Teil der Fälle sind die Angaben zu unvollständig, als dass sich die Fälle näher klassifizieren liessen. In zwei Fällen konnte der Appendix per rectum getastet werden. Bei dem einen dieser Fälle — einem 60-jährigen Mann (Burchard 1914) — wurde der ganz invaginierte Appendix als ein Polyp aufgefasst und exstirpiert; dabei erkannte man seine wahre Natur, weshalb man sofort Laparotomie vornahm. Bei dem andern, unsichreren

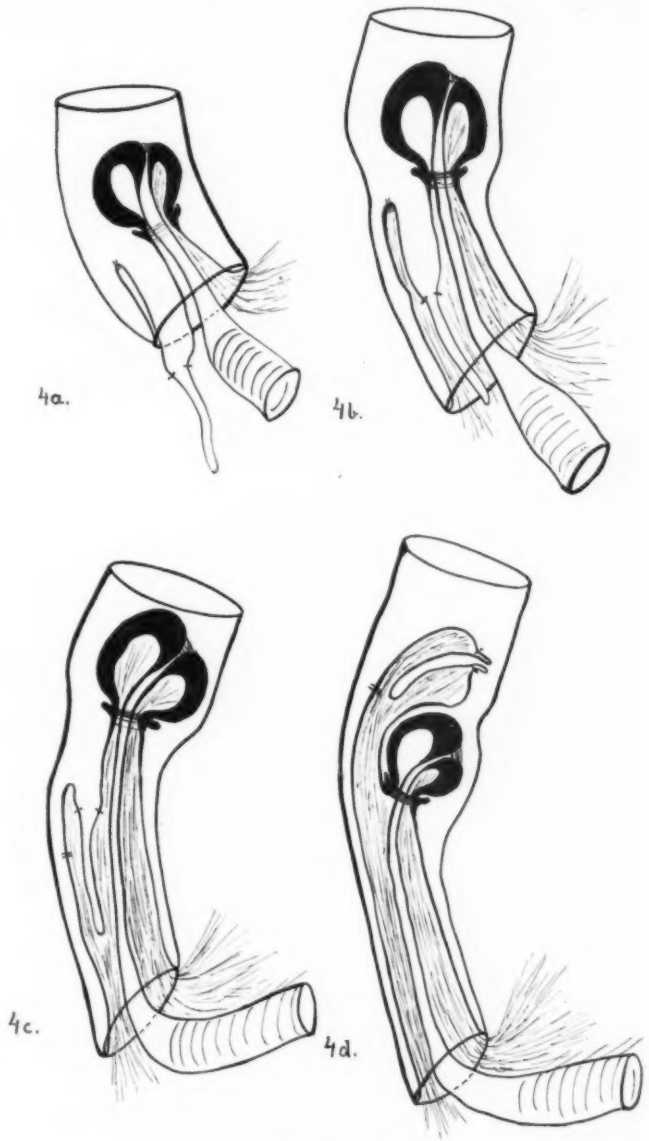

Abb. 4 a—d.

Fall — einem 7-jährigen Knaben (publ. von JALAGUIER 1905) — erfolgte Spontanreposition (??), aber bei der Appendektomie einen Monat später fand man den Appendix dick und geschwollen. Vor dieser Operation hatte man auch an die Möglichkeit eines eingestülpten Meckelschen Divertikels gedacht.

Die Fälle von SZENES verteilen sich also folgendermassen auf die vier Gruppen:

1. Zu der ersten Gruppe, bei welcher der Appendix nur in sich selbst invaginiert ist, konnte SZENES nur einen seiner Fälle rechnen, eine retrograde Invagination, veröffentlicht von KUSS-GUIMBELLOT 1907. Die Invagination zeigte den aus der Skizze (Fig. 5 a) ersichtlichen Typus.

2. Zu der zweiten Gruppe (Fig. 5 b—c) rechnet er zwei seiner Fälle, von denen der eine möglicherweise agonal entstanden, der andere (DODDS-PARKERS Fall) nach dem Beobachter und SZENES wahrscheinlich durch Spulwürmer verursacht war. In den beiden genannten Fällen war die Inversion total. Die Wirkung des Spulwurms bei Entstehung der Invagination kann eine mehrfache gewesen sein, in der Hauptsache dürfte sie jedoch meines Erachtens durch die Versuche des Spulwurms, den Appendix zu verlassen, hervorgebracht sein; sein eventueller peristaltiksteigernder Effekt dürfte eine geringere Rolle gespielt haben.

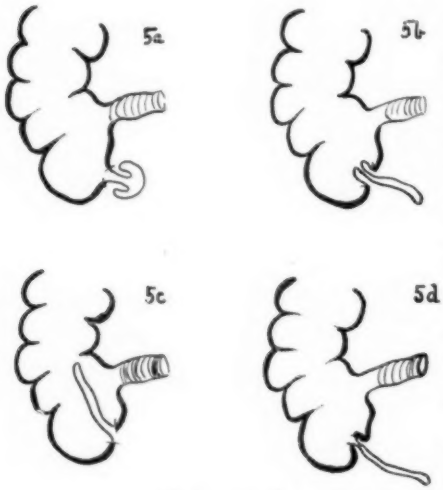

Abb. 5 a—d.

3. Zu der dritten Gruppe werden 17 Fälle gezählt, in 5 von diesen lag totale Inversion vor. In einem unbedeutend ausgebildeten Fall der zweiten oder dritten Gruppe kann es makroskopisch sicher oft schwer sein zu entscheiden, zu welcher der genannten Gruppen der Fall zu rechnen ist (siehe Abb. 5 b und 5 d).

Über die Möglichkeiten und die Anlässe der Entstehung primärer Appendixinvaginationen lässt sich kurz folgendes sagen.

Eine Invagination des Appendix wird durch spezielle anatomische und funktionelle Verhältnisse begünstigt. Zu den ersteren gehört ein fetaler Appendixtypus mit trichterförmiger Basis. Auch eine Anzahl pathologische Prozesse können — durch von ihnen hervorgerufene anatomische Veränderungen und abnorme Spannungsverhältnisse in der

Darmwand — die Bildung einer kleinen Appendixinvagination fördern. So kann z. B. unter gewissen Umständen eine lymphoide Hyperplasie oder eine andere örtliche, mehr chronische Anschwellung an der Appendixbasis selbst eine laterale Invagination der Wand verursachen und dadurch evetuell auch die Appendixbasis einstülpen. Auch ein in letzterer sitzender Tumor kann, wenn er gross genug ist, für die Peristaltik im Colon erfassbar werden und eine Appendixinvagination herbeiführen. Zu funktionellen, Invagination bewirkenden Momenten könnte man die Eigenbewegungen des Appendix rechnen (siehe unten).

Dass der fetale Appendixtypus von sehr grosser Bedeutung in diesem Zusammenhang ist, geht u. a. daraus hervor, dass zwei Drittel der Fälle sowohl von primärer als von sekundärer Invagination unter 10 Jahre alt sind. Hierzu trägt sicher auch die in diesem Alter gern auftretende lymphoide Hyperplasie bei. Ungefähr zwei Drittel sämtlicher Fälle sind männlich, doch ist darauf hinzuweisen, dass dieses Überwiegen ausschliesslich in der Altersgruppe von 0—10 Jahren zu bemerken ist. Bei Patienten über 10 J. (ein Drittel der Fälle) besteht kein ausgesprochener Frequenzunterschied zwischen den Geschlechtern. In der soeben erwähnten Altersgruppe unter 10 Jahren finden sich keine Fälle unter 2 Jahren, weshalb man bei *dieser* Kasuistik nicht zu derselben Erklärung für die Entstehung eines Teils der Invaginationen greifen kann wie bei Invaginatio ileocoecalis, die bekanntlich eine ausgeprägt hohe Frequenz in den beiden ersten Lebensjahren aufweist. Dieselbe Frequenzkurve hat sich auch bei Serien von Leistenbrüchen ergeben. Da der Bruchkanal während des ersten Lebensjahres offen zu sein pflegt und ferner bei Knaben gewöhnlich weiter ist als bei Mädchen (in der Regel am weitesten auf der rechten Seite), erscheint die Annahme nicht unbegründet, dass gelegentliche Bruucheinklemmungen am leichtesten bei männlichen Kleinkindern eintreten. Eine solche kürzlich eingeklemmte Darmwandpartie (unteres Ileum oder Zökalpol) kann dann durch Anschwellung und Inversion leicht eine Invagination verursachen (Laurell). Dass diese Erklärung auf Appendixinvaginationen nicht angewandt werden konnte, kann jedoch teilweise darauf beruhen, dass die Anzahl sicherer primärer derartiger Fälle nicht mehr als 19 betrug, weshalb jede statistische Bearbeitung sehr heikel sein muss. Ausserdem dürfte bei solcher Einklemmung vor allem die Spitzenpartie des Appendix eingeklemmt werden, und hier kann in der Regel keine primäre Invagination entstehen.

In einem Teil der Fälle war ein pathologischer Prozess der wahrscheinliche Anlass der Invagination. So lag in zwei Fällen ein Tumor im Appendix vor (Blaxland, Burchard). In Szenes' eigenem Fall bestand eine lymphoide Hyperplasie im Appendix mit Prolaps der Schleimhaut in das Zökum.

Dass der Appendix die Fähigkeit zu Eigenbewegungen besitzt, ist von so vielen Seiten festgestellt worden, dass eine weitere Diskussion hierüber unnötig sein dürfte. Diesbezügliche Experimente sind u. a. von RÖSSLE und WESTFAL angestellt worden. Röntgenologische Studien mit Konstatierung von Eigenbewegungen des Appendix haben FORSSELL, GOTTHEINER, KNOTHE, STRÖM, COHN u. a. betrieben. Ferner hat KLEIN einen Fall beschrieben, wo er Erektion eines Appendix, der in einem Bruchsack eines einjährigen Kindes lag, beobachten und nach Belieben hervorrufen konnte. Inwieweit die Eigenbewegungen des Appendix zur Entstehung einer Appendixinvagination beitragen können, dürfte indes sehr unsicher sein.

Enges Lumen des Hauptteiles des Appendix oder Fixation der Appendixspitze kann verhindern, dass eine begonnene Appendixinvagination vollständig wird.

Das klinische Bild

In der Mehrzahl der Fälle von leichterer Appendixinvagination war das klinische Bild durch *kurzdauernde*, intermittierende, oft sehr *intensive* Schmerzen von Koliktypus gekennzeichnet. Diese Kolikanfälle dürften zu einem wesentlichen Teil auf Straffung des Mesenteriolums beruhen. Oft lag kein Fieber in diesem Stadium vor, aber Erbrechen ist im Zusammenhang mit den Anfällen gewöhnlich. Bisweilen konnte ein kleiner Invaginationstumor getastet werden. Manchmal war etwas Muskelverteidigung über der Appendixgegend nachweisbar. Das Ganze stellt also ein Symptombild dar, wie man es nicht selten bei einer chronischen Appendizitis findet, wenn auch vielleicht mit durchschnittlich etwas stärkeren Symptomen bei Appendixinvagination.

Die Therapie besteht natürlich in Desinvagination des Appendix und anschliessender Entfernung desselben. Zwecks Verhütung von Reinvagination der Appendixbasis schlägt SZENES vor, ausser der Appendektomie, stets eine kleine Zökalamputation zu machen. Dies ist auch in mehreren Fällen geschehen, aber dann oft, weil vollständige Desinvagination des Appendix nicht möglich war, so dass man sich gezwungen sah, auch den umgebenden Teil der Zökalwand zu resezieren. Eine gewöhnliche Fixation des Zökalpols, vergleichbar mit Darmfixation bei andern Invaginationsformen, dürfte sonst das Richtigste sein.

ZUSAMMENFASSUNG

Der Verfasser beschreibt einen Fall von partieller, primärer Appendixinvagination, wahrscheinlich der erste durch Röntgenuntersuchung diagnostizierte. Appendixinvagination ist eine in der Literatur spärlich vertretene Krankheit. SZENES hat 1922 20 solche primäre Fälle zusammengestellt. Später sind weitere 6 Fälle veröffentlicht worden, zu denen nun ein siebenter kommt.

SUMMARY

Report of a case of partial, primary invagination of appendix, most likely the first that has been detected by roentgen examination. Only very few cases of this affection are reported in the literature. In 1922 SZENES has compiled 22 cases of invagination of appendix. At a later period further 6 cases were published to which one more case may be added now.

RÉSUMÉ

L'auteur décrit un cas d'invagination appendix partielle primaire, vraisemblablement la première diagnostiquée par les recherches Roentgen. L'invagination appendix est une affection qui se présente rarement dans la littérature médicale. SZENES a fait un tableau de 20 cas en 1922. Plus tard, 6 cas ont encore été publiés et maintenant il s'y joint un septième.

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(PHYSICIAN-IN-CHIEF: PROFESSOR DR. MED. T. DALE)

ON THE SIGNIFICANCE OF LARGE NICHES IN THE STOMACH[1]

by

Helge Myhre

The sight of a giant niche in a roentgenogram of the stomach will always provoke a strong suspicion of cancer, and one is almost astonished if it turns out not to be. This attitude is caused by a statement often seen, that niches measuring more than 2.5 cm. in diametre nearly always are of a malignant nature.

To elucidate this problem I have collected a material of twentythree large niches photographed and operated on at the University Clinics of Oslo. Except for the condition that the patients should have been operated upon, the selection of the cases have been based exclusively on the roentgenograms. I have included all the niches with an aperture wider than 2.5 cm., provided that infiltration of the stomach wall outside the swollen edge of the niche did not clearly prove it to be a cancer. (Fig. 1.)

These niches were all located to the corpus ventriculi or to the proximal part of canalis. In the distal part of canalis the pathological changes should probably have given so serious symptoms that they would have been detected at an earlier stage. Some of the niches had a deep incisure of the greater curvature vis-à-vis, a feature most often indicating benignity. (Figs. 2 & 3.) All the niches were provided with a swollen edge or elevated wall, which is in accordance with the fact that so large benign ulcers will be callous. In the benign ulcers this wall may show some irregularity caused by inflamed and swollen mucosal folds. The niche may be polygonal both in face-view and in profile without being malignant. (Figs. 4 & 5, 6, 7 & 8.)

In most of my cases doubt prevailed as to the roentgenological diagnosis, and often the condition turned out to be the opposite of what

[1] Submitted for publication March 14, 1941.

Fig. 1. Crater at angulus with irregular swollen wall. Infiltration outside the wall at (←) excludes this case from my material.

Fig. 2. Large benign ulcer at lesser curvature with swollen edge and incisure vis-à-vis.

Fig. 3. Polygonal benign crater at angulus.

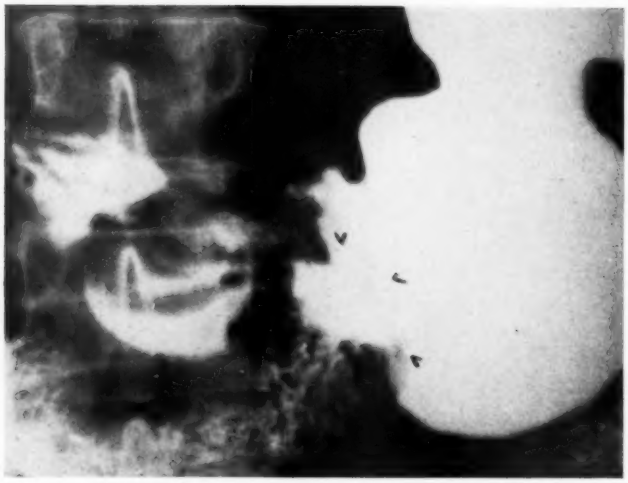

Fig. 4. Polygonal, microscopically malignant, crater; after resection believed to be a benign callous ulcer by the surgeon.

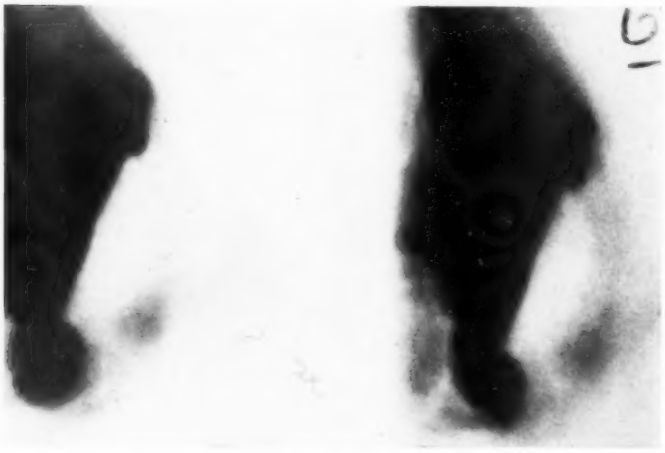

Fig. 5. Large benign ulcer with sharp angles.

had been regarded as most probable. Clinical considerations did not usually solve the problems. In both the benign and malignant groups most of the patients had for many years suffered from indigestion which had generally grown more troublesome and perhaps changed character

during the last six or twelve months. The patients' age ranged from 38 to 74 years, except for one patient suffering from cancer at the age of 33. Fæcal examination was performed in most cases always disclosing the presence of blood. *The gastric juice always contained free hydrochloric acid* (some of the benign ulcers were not examined), the figures ranging from 10 to 34 in the benign cases, and from 12 to 57 in the malignant ones. The latter group had at any rate not less free acid than the former, but I abstain from calculating mean values because of the restricted material.

Fig. 6. Surgically removed specimen showing the same ulcer as fig. 5.

At the operations large callous craters were disclosed, the classification of which as benign or malignant was often impossible macroscopically. At least two cancers were thought to be benign callous ulcers by the operating surgeon. In some cases glandular metastases gave some information. Deep penetration into neighbouring organs and large inflammatory tumor occurred frequently.

My material of 23 craters turned out to represent 9 cancers and 14 benign ulcers. In one cancer patient the operation — because of a mass of infiltrated glands in the gastrohepatic omentum — was limited to an exploratory laparotomy. In another cancer case only a gastroenterostomy was performed as the crater was found to penetrate deeply into the pancreas. The other seven patients had their stomach resected.

In one patient suffering from a benign ulcer only a gastroenterostomy was performed, and in two others only an exploratory laparotomy as the ulcers looked benign and would have been difficult to resect. In both the latter cases the niche disappeared during a dietary regimen, but 6 years later an extensive cancrous infiltration of the upper half of the stomach was detected in one of them. Perhaps this patient should preferably be placed in the cancer group, he will be more fully discussed later. (Fig. 9 & 10). In the other 11 cases of benign ulcers resection of the stomach was performed. I have re-examined a great number of sections from the remains of the surgically removed specimens of these

Fig. 7. Malignant crater with a resemblance to fig. 5.

Fig. 8. Large niche at lesser curvature with incisure vis-à-vis, thought to be benign at exploratory laparotomy (1932).

11 benign ulcers. Staining with mucicarmine was also employed. I found no trace of malignity, which agrees well with the results of the previous routine examinations in The Pathological Institute. The microscopical appearance of the ulcers was the common one: — The crater is lined towards the lumen of the stomach by a structureless, fibrinoid stratum. Next to it comes a necrotic layer with nuclear shadows, and beyond this a proliferation of connective tissue infiltrated by neutrophile and eosinophile leucocytes, plasma cells and giant cells of the foreign body type. Frequently the media of the arterial wall appears degenerated and takes a bluish-red stain from the mucicarmine. Some of the arteries are also thrombosed.

In the 7 cancrous ulcers I found the same layers, which according to MALLORY, are fairly characteristic of peptic ulceration. The great

Fig. 9. Complete disappearance of the niche in fig. 8. (1933).

Fig. 10. Cancerous infiltration of the upper half of the same stomach as fig. 8 & 9, six year later (1938).

inflammatory proliferation of connective tissue dominated the picture. The neoplastic tissue was inconspicuous. The cancer cells varied both in size and appearance. Histoid arrangement occurred in two cases, in the remaining five the malignant cells were placed in small disseminated groups; in some cases they were difficult to perceive. In two cases the cells took on a strong, in the others only a slight, mucicarmine stain.

At the beginning I mentioned the limit of 2.5 cm., often quoted in the differential diagnosis between benign and cancrous niches (ALBRECHT, KIRKLIN). The statement is probably originally due to MAC CARTY. ALVAREZ and MACCARTY maintain that among craters with a diametre less than 2.4 cm. simple ulcers occur ten times as frequently as cancers. Between 2.4 cm. and 3.7 cm. cancer is found twice as often as benign ulcer, and a diametre more than 3.7 cm. practically always signifies malignancy. ALVAREZ and MACCARTY have performed their measurings on surgically removed specimens in a pathological institute, i. e. presumably in a cooled and shrunken material. The above figures, however, are not directly applicable to roentgenograms, a fact most

likely recognized by the authors but often overlooked by others. Owing to the divergency of the rays the roentgen pictures give a magnification of 10—15 %. Furthermore, the said authors have probably measured all carcinomatous ulcers, not only those which might roentgenologically simulate benignity. Their material of proved benign ulcers measuring more than 3 cm. numbered only nineteen.

Among my 14 benign niches one measured 2.5 cm. in diametre in the roentgenogram, another 6.5 cm., the rest between 3 and 4.5 cm. Among the 9 malignant ones one measured 2.5 cm., the rest between 3 and 4.5 cm. In the surgically removed specimens the ulcers generally showed a smaller — only a few showed a larger — diametre than the corresponding roentgenological niches. Several niches 4.5 cm. wide, represented ulcers of 3 cm.

The question spontaneously arises whether my 9 malignant craters could have been cancers in ulcers. The answer must be that, first and foremost, none of them fulfilled the demand that malignant cells should only appear in the border of, and none at the base of, an ulcer undergoing malignant degeneration. None of the cancer cases had been subjected to roentgenological examination at earlier stages, whereas niches had been previously detected in some of the large benign ulcers. The problem of cancer in ulcer has been much discussed. There exists a clear tendency towards classifying large ulcerating cancers with a maintained secretion of free hydrochloric acid as malignant degeneration of benign ulcers. On the other hand the question may arise whether the aspect of these cancers is not due just to the presence of hydrochloric acid and peptic ulceration. This possibility is mentioned as early as in 1898 by TRIPIER who speaks of rodent ulcers of the stomach. Later on it has been stressed by American authors. MALLORY is in doubt as to the existence of cancer in ulcer, holding forth that all the alleged characteristics of such a tumor may be accounted for by a presumed peptic ulceration of a carcinoma. He also maintains that a peptic ulcer in a carcinoma may heal up for the time being while under an adequate dietary regimen. In those cases in my material where the last mentioned measures have been tried no such false success was obtained. (But neither have the large benign ulcers shown any special tendency towards healing; this was also generally the very reason why they were operated upon.) It is possible that the previously mentioned patient suffering from a supposed benign ulcer and who developed a cancer 6 years later, may have had cancer all the time. If this is correct my material consists of 10 cancers versus 13 benign ulcers. — EWING feels that, indeed, there is evidence that the carcinoma may be completely digested away by peptic activity, leaving a typical benign ulcer. SCHINDLER, with his vast experience of diseases of the stomach, believes that malignant

degeneration of ulcers must be very rare as he has never seen any proved case.

I have gone so closely into the question of cancer in ulcer versus ulcer in cancer because of its significance to diagnosis. The differentiation between benign and malignant ulcer is often based on a trial period of dietary measures, but in certain rare cases this test may deceive, as observed by various authors (EUSTERMAN & BALFOUR, GRAY).

From my material I feel entitled to conclude, contrary to prevalent opinion, that if no definte sign of cancer is to be traced in the roentgenogram the large niches with an aperture of 3 cm. and more, can be taken to represent benign ulcers at least as often as malignant, probably even more often. However, some of them really are malignant, and then the differential diagnosis may be quite impossible even *e juvantibus*, because a roentgenological improvement during dietary treatment may prove to be false.

SUMMARY

The author holds forth that niches with an aperture of 3 cm. or more, probably represent benign ulcers more often than malignant ones, if no definite sign of cancer is present in the roentgenogram. He further discusses the question of cancer in ulcers.

ZUSAMMENFASSUNG

Verfasser behauptet dass wenn kein sicheres Kanzer-Zeichen vorhanden ist Nischen von einer Öffnung grösser als 3 cm. wahrscheinlich öfter gutartig als bösartig sind. Weiter wird die Frage Kanzer-ex-Ulcere erörtert.

RÉSUMÉ

L'auteur est d'avis qu'au cas oú il n'y a aucun signe radiologique marqué de cancer les niches d'un orifice de 3 centimetres ou plus représentent probablement des ulcères bénins plus souvent que des ulcères malins. Il discute en plus le problème du cancer émanant des ulcères.

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FROM THE ROENTGEN DEPARTMENT ST. GÖRANS SJUKHUS, STOCKHOLM
(HEAD: NILS WESTERMARK, M. D.)

A SIMPLE METHOD OF LOCALISING FOREIGN BODIES[1]

by

Nils Westermark

In current roentgen literature there are a good many more or less complicated methods described of localising foreign bodies. Particularly during the last World war 1914—1918 a great number of works on this subject were published. As in these times of ours the localisation of foreign bodies may again become a matter of actual interest it may be justified to describe a simple method I have been using for many years, more particularly for localising foreign bodies in the thorax and abdomen.

To be able to make use of this method we must have the possibility of making a screening examination, we must have at our disposal an examination table or chair which can be rotated round its long axis and the patient must be fixed to this table or chair. Before examination the roentgen tube is so adjusted that its central ray passes through the rotary axis of the table or chair. For the sake of convenience the initial position of the tube may be thus marked once and for all. The tube focus and the axis of the examination table thus lie in the same line. The patient is then placed on the table or in the chair so that the foreign body comes to lie on the same line as the focus and rotary axis of table, thus in the line of the central ray. The patient is then secured to the examination table and metallic indicators are fixed on the skin, behind and in front, on a line coinciding with the central ray. It is clear therefore that the two indicators, the foreign body, the rotary axis of the examination table and the tube focus are all in the same line. The table or chair is then rotated through an angle of any desired magnitude. The distances between the indicators and the foreign body and that between the two indicators are measured orthodiagraphically on the screen which is at right angles to the central ray. The distance from an indicator to the foreign body bears the same ratio to the orthodiagraphic-

[1] Submitted for publication, Febr. 19, 1941.

ally measured distance between the same indicator and the foreign body after rotation as the distance between the two indicators to the measured distance between the indicators on the screen.

The method gains in simplicity if as the rotary angle we decide on an angle of 30°. With this angle the measured distance on the screen between and indicator and the foreign body will be equal to half the distance between the same indicator and the foreign body as a result of sin. 30° = ½. By this angle we are also able to check in an excellent manner the computation since the distance between the indicators as measured on the screen is equal to half the true distance between the indicators, directly measurable.

The method is exceedingly simple to carry out and the calculation very rapidly done especially if the rotary angle is set at 30°. It has the advantage of permitting immedicate checking of the calculation. It suffers the same drawback as other methods of localisation by the foreign body possibly becoming shifted during the operation. This is the difficulty in all cases of foreign bodies being located in some mobile organ, such as muscles or lung.

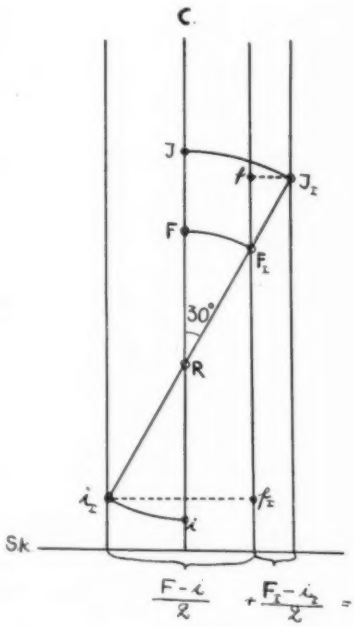

Fig. 1.

In explanation of marks of adjoined figure showing the principle of the method.

R = rotary axis of examination table.
Sk = visual screen.
C = central ray.
F = position of foreign body.
F_1 = position of foreign body after rotation of ex. table with patient.
I = position of posterior indicator.
I_1 = position of posterior indicator after rotation of ex. table with pt.
i = position of anterior indicator.
i_1 = position of anterior indicator after rotation of ex. table with pt.

The distance sought for the foreign body is equal to the distance between F and I which is equal to that between F_1 and I_1.

The distance between F_1 and I_1 as measured on the screen = half

the distance F_1—I_1, i. e. the distance between the indicator and foreign body.

The orthographic distance I_1—i_1 = half the distance I_1—i_1, i. e. the distance between the two indicators.

SUMMARY

Account of a simple method of localising foreign bodies based on the relationship sin. $30° = {}^1/_2$.

ZUSAMMENFASSUNG

Bericht über eine einfache Methode zur Lokalisierung von Fremdkörpern auf Basis eines Verhältnisses von sin. $30° = {}^1/_2$.

RÉSUMÉ

Exposé d'une méthode simple de localisation des corps étrangers fondée sur la relation Sin. $30 = {}^1/_2$.

FROM THE ROENTGEN CLINIC OF THE STATE HOSPITAL, COPENHAGEN, DENMARK
(CHIEF: PROF. P. FLEMMING MØLLER, M. D.)

TERMINAL ILEITIS[1]

by

Svend A. Chrom, M. D.

As regards the group of diseases localised to the ileocecal junction there has long been uncertainty about the differentiation between such closely related affections as specific, chronic inflammations, non-specific, chronic inflammations and neoplasms; and corresponding to this the designations used in different countries and by the different authors have varied greatly, which has not made it easier to bring some order into this group.

In 1932, CROHN and his collaborators published a report from the Mount Sinai Hospital, New York, of 14 cases of an intestinal affection localised to the terminal portion of the ileus and characterised by non-specific, chronic or subchronic inflammatory changes in the mucosa and submucosa. They described the disease as a clinical and pathoanatomical entity and termed it, neutrally, regional ileitis. In the course of the following discussion, the designation »terminal ileitis» was proposed.

Later, similar cases were reported from Germany by ANSCHUETZ (1934) and VON HABERER (1939), who called attention to the fact that cases of the same nature had been described before in the German literature, for instance by LOEWEN, in 1914, under the designation »idiopathic ileocecal tumor on the basis of appendicitis». Of Scandinavian authors, STRÖMBECK has given an exhaustive description of the etiology, symptomatology, clinical features and therapy of terminal ileitis; a work in which the roentgenologic findings are analysed by C. J. HANSSON. In Denmark, 2 typical cases were reported by KAPEL in 1934; in 1938, CHARLES JOHANSEN read before the Society of Surgeons a paper on acute and chronic inflammation of the intestinal wall, two of which were typical cases of terminal ileitis; and in 1938 JENS NIELSEN demon-

[1] Read at the meeting of the Danish Radiological Society, December 1940; submitted for publication March 22, 1941.

strated in the Radiological Society the roentgenographs of another, similar case.

Before proceeding to the report of my own cases I shall briefly describe the pathologic picture of the disease on the basis of CROHN's and STRÖMBECK's publications.

Terminal ileitis oftenest occurs in adults in the ages from 20 to 40 years. The incidence is twice as frequent in males as in females. There is a simple form, with acute or subacute symptoms resembling those of appendicitis. In these cases the diagnosis will also invariably be appendicitis, and only operation discloses redness and slight tumefaction of the terminal ileac loop, while the appendix is found to be normal. An uncommon form, acute, phlegmonous terminal ileitis may be mentioned in passing, but the most common is the hypertrophic, which has a chronic course alternating between symptom-free periods and periods marked by diarrhea, dull pain oftenest located to the right iliac fossa, lack of appetite, nausea and loss of weight. During the periods of diarrhea and pain there will often be rises in temperature. In an early stage of the disease such attacks will readily lead to the suspicion of appendicitis, and it is noticeable in how many of the cases appendectomy has indeed been performed.

Often a chronic terminal ileitis will for a long time run a latent course, until the acute exacerbation of the inflammatory processes discloses the true nature of the disease, in rare cases even under the alarming picture of a subileus or an ileus.

After two-three years marked by the alternating periods just described, the disease passes into the fistular stage with perforation outwards, oftenest to the right iliac fossa. Internal intestinal fistulae are often seen, but do not give rise to characteristic symptoms. Perforations to the peritoneal cavity are rare. When the disease has reached this stage its diagnosis should not be very difficult, but before that time it may not be so easy to recognise, and roentgen examination will then be an important aid to the solution of the problem. KANTOR (1934) has given an instructive description of the characteristic changes in the roentgenologic image. The examination is carried out by study of a barium-meal passage with hourly observations. The following changes are said to be characteristic:

1) Constant defect of filling, corresponding to terminal ileac loop the degree of the defect depending on the extent of the stenosing processes.

2) Irregular outlines of the ileac loops proximal to the filling defect.

3) »String sign».

KANTOR points out that string sign has been confused with a filled appendix, and that also contracted small intestines may give a picture resembling string sign; but that, in contrast to the condition in case of terminal ileitis, this picture will change from one exposure to another. He also mentions changes in the cecum and involvement of the latter, as well as mucosal changes resembling colitis. Similar changes were found also by CROHN and his collaborators in most of their first fourteen cases, and CROHN states that in preparations obtained from the operations they found fibrous and inflammatory pericecal changes, presumably due to spread of the process from the contiguos ileac loop.

The question of the relationship between ileitis and colitis, especially ulcerative colitis, has given rise to many deliberations. In 1936, CROHN and ROSENAK published a paper on »A combined Form of Ileitis and Colitis». By that time they had examined and treated 60 cases of ileitis, in 9 of which they noted complicating or associated colitis. In these nine cases they found destructive, ulcerous changes both in the colon and in the ileum, but the stenosing, fistulous, granulomatous process so characteristic of primary ileitis was entirely absent, and they therefore once more maintained the justness of regarding the latter disease as a separate pathologic entity.

In the differentiation from other diseases several possibilities have to be considered. In the more or less active stages the pathologic picture often resembles that of ulcerous colitis, and in such cases inspection of a barium-meal passage, combined with a barium enema, will probably give the correct solution. Also intestinal tuberculosis, lues, actinomycosis and sarcomas may give rise to stenosing processes; but in these cases roentgenographic studies alone will not solve the problem, and the diagnosis must in the last instance rest on the clinical data.

In 1939, HADFIELD published the results of histologic examinations of 17 cases of terminal ileitis. Macroscopically, from 4 to 60 cm. of the ileum were involved. The terminal ileum and ileocecal region were affected in 17 cases and the distal ileum in 3. Fistulae from the bowel lumen to the abdominal wall or the bladder were present in 7 cases. In no case did the condition affect the jejunum or the rest of the colon. Ulceration of the mucosa was present in all cases. All transitions were found between cases in which ulceration was superficial and those in which there was great loss of substance. The ulcerations were always situated corresponding to the attachment of the mesentery, with the oldest lesions nearest to Bauhin's valve. HADFIELD believes that the primary changes take place in the submucosa, with formation of heaps of epithelial cells, scattered giant cells, and hyperplasia of the lymphatic tissue with secondary lymphostasis followed by stenosis with ulceration of the mucosa. In his opinion, the histologic changes closely

resemble those seen in cases of Boeck's sarcoidosis, and he therefore ventures the suggestion that terminal ileitis may be simply an intestinal manifestation of that disease. He thus attempts to give an explanation of the etiology of the condition, while all other authors merely state that its etiology is obscure.

In the last few years, 4 cases of terminal ileitis have been diagnosed in the State Hospital in Copenhagen.

Case I. — M. H., female, aged 52; admitted to med. dep't B. Dec. 1st, 1934. — In her younger days she was always in good health; has given birth to four children. Six years before her admission she had been found to be suffering from anemia (hemoglobin, 50 per cent). Was given iron with good effect. The hemoglobin percentage after that time varying, but was raised by treatment with chalybeates. For a year past suffering with undefined dyspepsia. Bowel movements normal and regular. Has lost 20 kg. in weight in the last year. Physical examination shows nothing abnormal except the anemia; specially no palpable filling in the right iliac fossa. Hemoglobin percentage, 55. Ewald's test meal, three times, showed achylia. Benzidine test of stools, positive. Rectoscopy, nothing abnormal.

Roentgen examination after barium enema showed that the intestine filled readily as far as to the cecal portion. This was very short and only partly filled, arousing suspicion of something pathologic. Bauhin's valve was insufficient. To examine the condition more closely a barium meal was given. In several exposures, irregularities of the inferior outline of the cecum were seen. Besides, there were defects in the filling of about 10 cm. of the terminal ileum. The appendix was filled and did not seem to present anything abnormal. Ten hours after the meal there was still some contrast in the nethermost loop of the ileum, indicative of ileostasis. There was undoubtedly an inflammatory condition corresponding to the ileocecal junction, the cause of which could not be determined from the roentgenographic image.

The patient was transferred to the surgical dep't; but operation was not performed, as the symptoms subsided. Her subsequent history is not known.

Case II. — M. J., female, aged 42; admitted to dep't B. May 25th, 1938. — In childhood healthy. Normal childbirths in 1925 and 1929. In 1932, severe angina. In 1933, right-side pneumonia. Since youth suffering with obstipation without dyspepsia. — Since Nov. 1937, dyspepsia, tenderness of the abdomen, pain across the loins. Since Jan. 1938, lassitude, loss of weight and violent diarrheas with blood and slime in the feces. — The objective examination shows nothing distinctive. No palpable mass in the abdomen. Ewald's test meal normal. Benzidine test of stools, positive. Rectoscopy at admission shows the mucosa succulent, vulnerable; a few hemorrhagic spots with a little pus.

Roentgen examination of the colon after barium enema showed nothing abnormal. Studies of the intestinal tract after ingestion of a barium meal showed that the barium passed rapidly through the jejunum and the upper portion of the ileum. Five hours after the meal, the colon had begun to fill. In the pictures in which the cecum was seen free, there seemed to be in the latter a small, constant filling-defect, the appearance of which was, however, a different in the different pictures. It was situated just above the opening of the appendix, immediately below the ileocecal junction. In the pictures taken eight and ten hours after the meal, the lower loops of the ileum were free, and these pictures showed in the extreme terminal portion of the ileum changes which gave this portion an appearance absolutely distinct from that of the portion of the ileum

above it. The contour was smooth, without the usual plicae, and one had the distinct impression that the mucosa was swollen and infiltrated. There was presumably a condition of inflammation in this portion of the ileum. The image of the defect in the medial aspect of the cecum, described above, was probably due to similar changes. Twenty-four hours after the barium meal the small intestine was empty. The barium filled the large intestine from the cecum to midway in the transverse colon.

After treatment with Yatren enemas (0.5 per cent), the patient was discharged with her bowel movements in order. Of her condition since there is no information.

Case III. — A. N. H., female, aged 54; admitted to med. dep't B. March 3rd, 1939. — Had been suffering with bileduct troubles since 1913. After being operated upon in the Haslev Hospital in 1920 (cholecystectomy), she was symptom-free until 1933. In 1934, 1936 and 1937 she again had severe attacks, for which she was each time admitted to the Haslev Hospital. After the last attack she developed a severe icterus, which has persisted since with varying severity. Of late she has been very enfeebled; has lost 30 kg. in weight in the last year. Her bowel function changes between long periods of obstipation and shorter periods with diarrhea. During the attacks of icterus her feces are acholic. Hemoglobin, 39 per cent. Benzidine test of stools, positive.

Roentgen examination of the intestinal tract during barium passage showed until 27 hours after the meal a constant filling of the ileac loop immediately before the ileocecal junction. The appearance of this segment of the intestine was very changing; at one time the lumen would be filled and its contour strangely irregular, at other times it would be quite narrow and the contour smooth. It was also noticeable that the loops of the intestine immediately above this portion remained constantly filled. From these observations there could be no doubt that there was a condition of ileitis in the terminal loop of the ileum. Also in the cecum changes were seen.

Operation was advised, but the patient demanded to be discharged. The subsequent history of the case is not known.

Case IV. — E. O. C., female, aged 35; admitted to surgical dep't D. July 17th, 1940. — Formerly in good health; nullipara. Had in 1937 been admitted to the Municipal Hospital, Copenhagen, dep't VI, for failing vision, hearing and memory. Lumbar puncture showed positive Wassermann, and she had undergone a malaria cure in dep't IV. Afterwards she had been given 21 injections of salvarsan and some bismuth injections. In April 1939 she was admitted to the Municipal Hospital, dep't I, for colicky pain in the right iliac fossa, vomiting and diarrhea. Her case was diagnosed as salpingitis, and at her own request she was discharged. According to her statement, there had on examination been felt a tumor, the size of a tangerine, in her right iliac fossa. During the sixteen months prior to her admission to the State Hospital she had six times had spells of pain in the abdomen, with dilatation of its upper part, accompanied by vomiting, diarrhea and rises of temperature. In the beginning of July, 1940 she was admitted to the Bispebjerg Hospital for an attack of colic, but after three days demanded her discharge.

On July 17th, 1940, she was admitted to the State Hospital after an attack of pain the previous night, during which her temperature had risen to 39°.5 C. At admission, her temperature was 38.2, the pulse 76. The patient was fat, not distressed or dried up. Objective examination showed her pupils inactive to light. Her abdomen was large and fat; in the right lower abdominal quadrant there was a fixed, almost spheric mass, not tender to the touch, about the size of a child's head. Rectovaginal exploration showed nothing abnormal. Wassermann, negative; Gono-test, negative. Of 6 benzidine tests of feces, 3 showed traces of blood, 3 were negative.

Roentgen examination of the colon after barium enema showed no obstruction to the inflow of the contrast substance. The colon filled readily, except the cecal portion, which in all the pictures showed poor filling, with changing, slightly irregular foldings. This aroused suspicion of an affection localised to this portion of the intestine, and a barium meal was given. In the pictures taken three, five and seven hours after, about 10 cm. of the ileum closest to the cecum showed an unvaried string-formed narrowing of the lumen. There was a distinct impression that the wall corresponding to this portion was rigid and infiltrated. Above it there were visible alterations in the mucosal relief of the ileum, with irregular, thickened contours. The fundus of the cecum was, as before, incompletely filled, its outline irregular. There was no ileostasis. From the pictures there could hardly be any doubt that a condition of ileitis existed, localised to the typical site at the junction with the cecum (see Fig. 1).

Resection of the ileo-cecal junction was performed. The resected specimen consisted of a portion of the ileum about 15 cm. long and a portion of the cecum and ascending colon 14.5 cm. long. The gut was cut open lengthwise. Opened, the ileum measured 5 cm. across just above its junction with the cecum; at the other end it measured 4.5 cm. The mucosa appeared natural, without ulcerations. In the fundus of the cecum and extending down under the terminal portion of the ileum there was a firm, whitish, tumorlike infiltration measuring up to 3 cm. in length and 4.5 cm. in width.

Corresponding to this, the mucosa of the colon was slightly hyperplastic; but it was not ulcerated, nor were there any positive signs of infiltration.

Histologic examination (VIGGO ESKELUND):

Different sections from the ileum showed some thickening of the wall in the distal part of the latter, but no increase of the connective tissue. Here and there in the wall were lymphocytes, in some places accumulated, in others more scattered. The inflammation got more pronounced outwards, in the subserosa, where there was also rather strong edema and some hemorrhage. Sections from the proximal portion of the segment showed very small, scattered infiltrations of lymphocytes, and the wall of this portion was not thickened. Histologic diagnosis: Ileitis.

Of two examined sections through the infiltrated portion of the fundus of the cecum, one showed remnants of cast-off colonic mucosa with numerous crypts with goblet cells, and, besides, considerable infiltration of lymphocytes. The wall itself was thickened, with denser, fine or coarse collagenic streaks of connective tissue, and in places showing a more fibrous, hyaline transformation. Scattered in this tissue were numerous accumulations of lymphocytes, and more diffusely a number of plasma cells and many eosinophile cells. There were no signs of tumor formation anywhere, and nothing indicating a specific inflammation. Histologic diagnosis: Chronic typhlitis.

If we for the sake of readier survey set the results of the roentgenologic examinations down in schematic form as done by KANTOR, the schema will look as follows:

Fig. 1.

Sex and Age of Patient	♀ 52	♀ 42	♀ 54	♀ 35
Defect in filling of terminal loop of ileum	+	+	+	+
Irregular outline of ileum proximal to the defect	+	+	+	+
Ileostasis	+	+	+	—
String Sign	—	—	—	+
Changes in Cecum	+	+	+	+

It is a curious circumstance that all the four patients were females above the age in which the disease is usually found; but the roentgenologic changes correspond exactly to those which KANTOR states as typical for the pathologic picture. The histologic examination of the one case in which operation was performed showed, as we have seen, a simple, chronic inflammation, and no changes in any way suggestive of Boeck's sarcoid.

SUMMARY

After briefly reviewing the literature and on this basis describing the pathologic picture of terminal ileitis, the author reports 4 cases of this disease and compares the findings in these cases with the characteristic roentgenologic findings described by KANTOR.

ZUSAMMENFASSUNG

Unter Zugrundelegung einer kurzen Literaturübersicht, beschreibt der Verfasser das pathologische Bild einer terminalen Ileitis und berichtet über 4 Fälle dieser Erkrankung. Weiters werden die Befunde dieser Fälle mit den von KANTOR beschriebenen charakteristischen Röntgenbefunden verglichen.

RÉSUMÉ

Après une courte revue de littérature médicale et avoir décrit, en se fondant sur cette littérature, l'image pathologique de l'ileïte terminale, l'auteur rapporte 4 cas de cette maladie et compare les découvertes faites dans ces cas avec les découvertes roentgénologiques caractéristiques décrites par KANTOR.

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FROM THE ROENTGEN DEPARTMENT, ST. GÖRANS SJUKHUS, STOCKHOLM
(HEAD: NILS WESTERMARK, M. D.)

ON EPITUBERCULOSIS AND LUNG ATELECTASIS[1]

by

Nils Westermark

In 1920 ELIASBERG and NEULAND described a pathological condition in children infected with tuberculosis which they called epituberculosis. In a later communication 1921 they gave an account of their further experiences of this condition, dealing particularly with the differential diagnosis between epituberculosis and tuberculous pneumonia in children. Epituberculosis is characterised by lobar or nearly lobar or more than lobar massive pulmonary consolidations of a chronic course occurring in tuberculous children during their first years of life. The radiological findings in this condition remind of those present in tuberculous pneumonia. ELIASBERG and NEULAND lay indeed stress on the great similarity existing between the radiological pictures of the two conditions. Yet there is a decided difference between the two conditions in that the general condition of the children taken ill with epituberculosis is decidedly favourable in relation to the widespread and well marked pulmonary changes. The prognosis in epituberculosis is also exceedingly good. In many cases there is complete 'restitutio ad integrum' after 6 to 12 months' illness, the consolidation having then gradually and completely disappeared. In other cases more or less pronounced and widespread opacities persist within the previously diseased lobe, such opacities being partly calcified, well localised and distinctly defined. In epituberculosis bronchiextasis is a very usual finding of persistent nature. Unfortunately ELIASBERG and NEULAND have failed to publish any radiographs of their cases but their description of the condition is so exceedingly well worded as to to give a vivid picture of the appearance of the changes.

ELIASBERG and NEULAND's first publication on epituberculosis created an interest already from the start and ever since a very lively discussion has been going on in the literature on the condition in question

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and its patho-anatomical basis. There now exists a very extensive literature on the subject but the patho-anatomical basis of the condition still remains to be elucidated. Some workers hold that epituberculosis constitutes a clinical entity and that the name given it should be maintained (KLEINSCHMIDT, SCHLACK, FERNBACK, BIRK and HAGER, LOOTS, ERBGUTH, RÖSSLE, FETTES). Others again maintain that epituberculosis does not form a uniform clinical picture (WALLGREN, DUKEN).

There are at present 3 different predominant theories in explanation of the epituberculous opacities.

1. The opacity is caused by tuberculous parenchymatous infiltration. This theory is supported among others by LANGER, RIBADEAU-DUMAS, WORINGER, FERNBECK, ARMAND-DELILLE, LEITMANN, SPENCE.

2. The opacity is wholly or partly caused by obstructive atelectasis. This theory is supported by STOLOFF, PROSOROFF, MORLOCH and PINCHIN, RÖSSLE, DE BRUIN, SÖDERLING.

3. The opacity is caused by a well-marked focal reaction as a result of excessive sensitiveness. This theory is supported among others by HARMS, FRIEDENBERG, REDEKER, BIRK and HAGER.

After perusal of the literature on epituberculosis I have found altogether 44 cases of so-called epituberculosis with appertinent radiographs in which cases one is fairly likely to have properly estimated the roentgen appearances. All these cases have presented a massive, lobar or nearly lobar opacity. This opacity was in by far the greatest number of cases localised to the upper lobe but in some of them other lobes were affected.

Among these 44 cases we can from a radiological point of view distinguish between two different types of changes. One lesser group comprises 7 cases in all. In these cases the massively dense lobe occupies a smaller volume than normal and the opacity shows a more or less well defined boundary to the adjacent non-opaque pulmonary lobe. These cases also show a distinct displacement of the heart and mediastinum to the affected side and retraction of the thoracic wall corresponding to the position of the opacity. In all these cases enlarged lymph nodes have also been noticed in the pulmonary hilum. The radiographic appearance in these cases is therefore characteristic of obstructive atelectasis. The second and larger group comprises altogether 37 cases. In these cases the massively dense lobe occupies a volume corresponding to its ordinary volume or a bigger volume than normal. The opacity shows a more or less well marked convex boundary to adjacent lobes. Heart and mediastinum are not displaced to the affected side but in some cases to the healthy side. Nor can any retraction be observed of the thoracic wall corresponding to the position of the opacity. The roentgen picture is most like that of pneumonia.

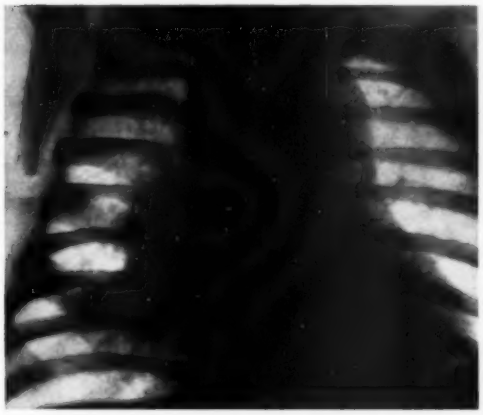

Fig. 1. Massive wedge-shaped opacity with concave boundaries located in the posterior lower part of the right lung. Glandular shadow in right hilus.

Of the 7 cases with the radiological appearance of lobar obstructive atelectasis one (EPSTEIN) was verified by autopsy.

This case shows a massive opacity of the left upper lobe with obvious retraction of the upper part of the left half of the chest and displacement of heart and mediastinum to the left. This opacity remained unchanged for about six months. The patient then developed signs of miliary tuberculosis with tuberculous meningitis. On autopsy one found in the upper part of the left upper lobe a central caseous tuberculous focus, partly liquefied, measuring 3 × 1.8 cm. Surrounding lung tissue showed signs of collapse of the lung. The bronchus of the upper lobe showed evidence of well marked caseous and ulcerous tuberculous bronchitis. The bronchopulmonal glands of the left side were enlarged and showed signs of tuberculous caseous lymphadenitis. On microscopical examination of the caseous area in the upper lobe there were widespread tuberculous foci, the seat of caseous degeneration. Surrounding lung tissue showed collapse of alveoli and was fairly rich in blood.

Autopsy thus showed not only signs of a primary focus in the upper lobe with lymph nodes in the hilum but also obstructive atelectasis of surrounding lung tissue. In addition to this there were also signs of tuberculous bronchitis of the bronchus of the upper lobe.

I have myself had a similar case.

It was the case of a girl, aged 8 months, who was taken ill with fever and coughing. Her general condition was fairly good and she had a temperature of 38°—39°. On roentgen examination (Fig. 1) there was a massive wedge-shaped opacity with concave boundaries located in the posterior lower part of the right lung. The opacity probably represented an infiltrated lower lobe diminished in volume. After having been in the same condition for a few weeks the child suddenly got worse one day, became hard of breathing and died.

On autopsy the right lower lobe was found to be severely collapsed and without air, its volume being much diminished as compared with the other lobes. The anterior

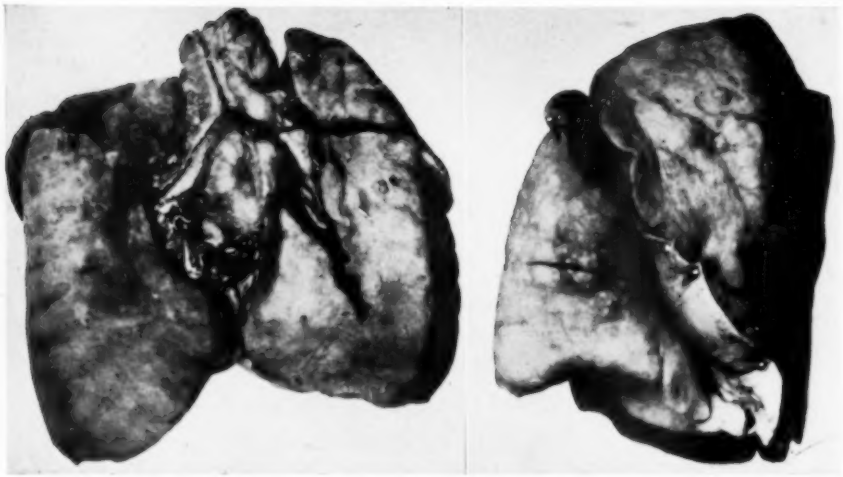

Fig. 2. Well marked collapse of the lower lobe with diminished volume and a concave boundary to the lobes in front. A primary focus in the lower lobe. Large glandular mass in the bifurcation and around the two main bronchi with compression of these. The bronchus to the right lower lobe is infiltrated and filled with tuberculous granulation tissue.

boundary of the lower lobe was clearly concave and in its posterior lateral peripheral part a caseous focus could be seen, the size of a bean. This focus continued inwards by way of lymphangitis toward the bronchopulmonal and tracheobronchial glands which formed a large confluent glandular mass surrounding the bronchus of the right lower lobe and the bifurcation. The bronchus of the right lower lobe was infiltrated with this glandular mass, the bronchus being filled with tuberculous granulation tissue which had evidently passed on from the gland into the bronchus. This granulation tissue had completely occluded the bronchus. Moreover the glandular mass in the bifurcation had almost completely compressed the two main bronchi without causing any infiltration of them. Thanks to this compression there only remained a narrow slit-shaped lumen in the two main bronchi. On microscopical examination caseating tuberculous tissue was found in the active centre, large as a bean, as also in the lymph-glands. The lower lobe showed well marked collapse of the alveoli which were much smaller than normal. In addition to this there was obvious hyperaemia of the lower lobe.

Autopsy thus showed not only a primary focus in the right lower lobe in addition to a tuberculous lymphadenitis but also obstructive atelectasis of the right lower lobe.

These 2 cases show the roentgen appearance of a typical obstructive atelectasis with massive opacity of an entire lobe. In both cases the opaque lobe occupied less volume than normal and presented concave boundaries to adjacent lobes. This finding was also verified post mortem. Thus in my own case autopsy showed well marked collapse of the lower lobe with diminished volume and a concave boundary to the lobes

in front. This reduction in volume was particularly noticeable in the fresh specimen during autopsy but it can also be observed in the fixed specimen (fig. 2).

In both cases there was a caseating primary centre in the collapsed atelectatic pulmonary lobe. There were also caseous lymph glands. In EPSTEIN's case the bronchial branches of the altered lobe were, moreover, the seat of well marked caseating, tuberculous and ulcerous bronchitis. In my own case there were no signs of tuberculous bronchitis but a caseous lymph gland had infiltrated the bronchus of the lobe and thereby caused its occlusion.

In my case therefore the bronchial occlusion was produced by lymph-gland infiltration of the bronchus of the collapsed lobe. It is also noteworthy that the large glandular mass in the bifurcation caused the two main bronchi to become compressed without causing any infiltration of them. The compression was so pronounced as only to leave a narrow slit-shaped lumen. Asphyxia was probably the cause of death in this case. In EPSTEIN's case the bronchial occlusion was probably caused by the tuberculous caseating ulcerous bronchitis although it is impossible to exclude that the caseating bronchopulmonal glands also might have contributed to the occlusion.

Among cases with a massively opaque pulmonary lobe of normal or increased volume 9 cases in all have been verified by autopsy or exploratory excision. So did LEITMANN in 1928 collect 8 cases from the literature of which 2 were his own cases of chronic lobar pulmonary infiltrations in tuberculous children who had died; autopsic examination had been made in one case. These cases also include EPSTEIN' above mentioned case. The 7 other cases have been published by ELIASBERG and NEULAND (1 case), GRÄVINGHOF (1 case), ENGEL (2 cases), FRIEDENBERG (1 case), LEITMANN (2 cases). Besides these I have found still another 2 cases published by CAMERON and RUBINSTEIN.

ELIASBERG's and NEULAND's case is that of a child, 11 months old, with widespread infiltration of the right upper lobe. The case was treated by pneumothorax. Eight months after pneumothorax had been induced the child was taken ill with extensive bronchopneumonia and bilateral empyema. No tuberculous changes were found in the lungs. The patho-anatomical picture in this case is not a pure one as pneumothorax treatment had been going on for 8 months and the lungs had also showed signs of extensive acute bronchopneumonia and empyema.

In GRÄVINGHOF's case death occurred 15 months after the lung infiltration had disappeared. On autopsy no tuberculous changes were found in the then already infiltrated lobe. The regional lymph nodes were enlarged and caseating.

On account of the above mentioned circumstances it is impossible to draw any definite conclusions from these cases as to the pathoanatomical basis of the infiltration.

On autopsy in ENGEL's two cases the infiltrated lung lobes proved firm and hard with a considerable amount of connective tissue transformation. In one of these cases were found in the hard transformed tissue scattered small tubercles and a larger case-

ous lung focus near the hilum. Both cases showed signs of enlarged caseating lymph-glands in the hilum.

FRIEDENBERG's case showed a massive infiltration in the right lung. Autopsy showed pneumonia of the upper and lower lobes in addition to right-sided adhesive pleurisy. The bronchopulmonal lymph glands had undergone tuberculous changes with partly caseous degeneration. Histological examination of the infiltrated lung revealed miliary tuberculosis and a tuberculous peribronchitis.

One of LEITMANN's cases had a lobar infiltration of the left upper lobe. The case succumbed after 4 months. Autopsy proved the left upper lobe to be of firm and hard consistence. The apex of this lobe contained a caseous centre measuring 2 × 4 cm. and below this there was a cavitation, the size of a walnut, with clean floor and a nodular surface.

LEITMANN's second case showed signs of massive consolidation of the right upper lobe with a convex lower boundary. This consolidation remained unaltered for more than 6 months. On autopsy the right upper lobe was found of firm consistence and made up of non-compressible tissue. In the apex there were 2—3 caseating centres, the size of hazelnuts. On section the lobe was found to be pervaded by connective tissue strands radiating toward the hilum. Microscopically the right upper lobe contained numerous miliary tubercles, necrotic in parts and with a considerable amount of connective tissue. The lung tissue was partly atelectatic and the alveoli were the seat of progressive desquamation.

CAMERON's case was that of a 7 months old boy taken ill with cough and fever. On clinical examination there was dulness and weakened breathing over the left upper lobe. On the suspicion of a possible empyema a puncture was made but with negative result. Radiological examination was carried out the following day when a moderate left-sided pneumothorax was found with the lung partly collapsed. The lower lobe was however more collapsed than the upper lobe. The latter was massively opaque while the former contained air. The child subsequently died of tuberculous meningitis. Autopsic examination revealed a sharply defined caseous primary focus near the apex. The upper bronchopulmonal glands on the left side had undergone caseous transformation. The two lower thirds of the left upper lobe included a wedge-shaped area with airless tissue. This area was of firm consistence and was raised above the level of surrounding lung tissue. On microscopical examination this wedge-shaped region showed absence of alveoli. The lung tissue showed a diffuse cell infiltration consisting of numerous epithelioid cells, a moderate number of fibroblasts and a small number of giant cells besides smaller caseous changes (fig. 3).

RUBINSTEIN's case is that of a girl, aged 4 years, who had been in bed for a couple of months with relapsing »influenza». By and by she was taken to see a doctor. On radiological examination there were signs of tuberculous lymph-glands in the hilum. After some time the patient was taken ill with high fever and coughing. On renewed roentgen examination one found a massive opacity corresponding to the distributive area of the right middle lobe. The opacity showed a convex boundary to neighbouring lobes. Interlobar empyema was diagnosed wherefore operation was considered indicated. The operation revealed a nodular and hard infiltration in the lower part of the middle lobe. On palpation this infiltration seemed to extend right in toward the hilum. The infiltrated lobe was clearly raised above the level of surrounding lung tissue. No effusion was found. From the lower margin of the infiltration a few pieces were taken for microscopical examination. This showed that the entire lung parenchyma was made up of round-celled epithelioid fibroblastic elements in addition to a lesser amount of alveolar epithelium and giant cells. Some cells showed signs of early necrobiosis. In the peripheral part of the specimen some alveoli could be distinguished with clearly

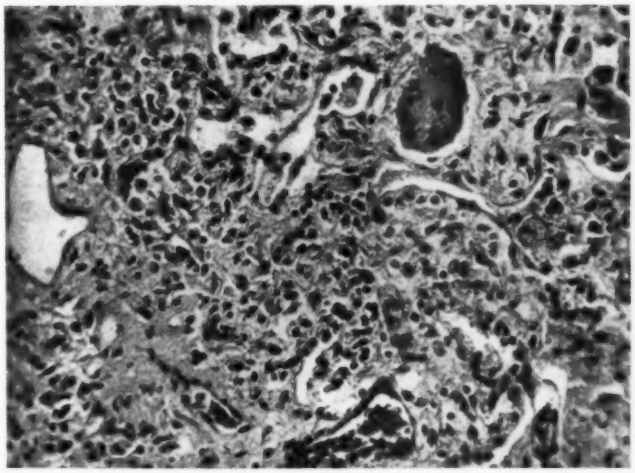

Fig. 3. Microphotograph showing endothelioid cells, giant cell and fibroblasts (after CAMERON).

enlarged lumina. At those places where the specimen was nodularly changed there was much increase in connective tissue.

The subsequent course was without complications and the wound healed by first intention. The condition did not undergo any changes until after 8 months when the temperature became normal. The clinical symptoms gradually disappeared and on a subsequent radiological examination the changes were found to have cleared up.

Among these 9 cases of chronic lobar lung infiltrations with autopsic findings no definite conclusions can be drawn regarding either ELIASBERG's and NEULAND's case or GRÄVINGHOF's case. ELIASBERG's and NEULAND's case was thus complicated by pneumothorax treatment lasting for 8 months and by extensive bronchopneumonia and empyema supervening towards the end. In GRÄVINGHOF's case the infiltration had been cleared up for 15 months before the autopsy. Judging by the reports the 7 remaining cases present a similar patho-anatomical process characterised by considerable increase of the connective tissue and a moderate presence of tubercles with in part caseous degeneration. In the majority of cases there was also a tuberculous primary focus in the changed lobe besides caseating hilar lymph-glands. As far as it is possible to judge from the reports and the microphotographs published in CAMERON's and RUBINSTEIN's cases it was in these cases a question of tuberculosis of chiefly proliferative type. It would seem likely therefore that the chronic lobar consolidations without shrinking phenomena and which correspond to ELIASBERG's and NEULAND's picture of epituber-

culosis are caused by pulmonary tuberculosis of chiefly proliferative type. True that in LEITMANN's second case there were also to be seen minor atelectatic areas within the changed region. It is thus possible that these atelectatic areas may help to create the consolidation although they would seem to be of less importance for its production.

From the aforesaid it is clear therefore that among the published cases of so-called epituberculosis, according to ELIASBERG-NEULAND, we are able to distinguish, from a radiological viewpoint, between two different clinical conditions. Both conditions appear on radiological examination as lobar or nearly lobar massive opacities of the lung. One of the conditions is characterised by the opaque lobe occupying a smaller volume than normal and generally showing a concave boundary to adjacent lobes. In these cases there is also retraction of the thoracic wall over the opaque lobe and displacement of heart and mediastinum to the affected side. The radiological appearance of this condition is thus the typical one of lobar or nearly lobar obstructive atelectasis.

The second condition is characterised by the opaque lobe occupying a volume which is as large as or bigger than the normal volume. The opaque lobe generally shows a convex boundary to adjacent lobes. Nor is there any retraction of the chest wall over the opaque lobe or any displacement of heart and mediastinum to the affected side. In some cases however we find expansion of the chest wall over the opaque lobe and displacement of heart and mediastinum to the healthy side.

Judging by the autopsic findings the condition yielding a roentgen picture of obstructive atelectasis also refers patho-anatomically to such an atelectasis. This is produced by the enlarged and caseating hilar lymph-glands either infiltrating or compressing the bronchus leading to the opaque region.

That condition, on the other hand — judging by the autopsic findings — which yields the appearance of a massive lobar opacity without shrinking phenomena and which seems to correspond to ELIASBERG-NEULAND's epituberculosis, really refers to a tuberculosis of chiefly proliferative type. In this form minor atelectatic areas may also be present. In these cases however the opacity would mostly seem to be caused by tuberculous tissue.

In both these cases however there is a tuberculous primary complex with the lung focus located in the dense area.

These two diseased conditions differ also from a clinical and prognostic viewpoint. Lobar obstructive atelectasis arisen through compression or infiltration of the bronchus leading to the lobe has a relatively good prognosis if the disease is of fairly short duration. Should however the obstructive atelectasis persist for a longer time then the prognosis

is unfavourable. I have had the opportunity to follow a few cases of this kind. The following is a case in point.

The case is that of a girl, aged 5 years, who had been under treatment for 12 months for tuberculous arthritis of the left elbow. On radiological examination of the chest a large mass of glands was found in the right hilum extending upwards along the trachea on the right side. The right lower lobe was massively opaque presenting a diminished volume and a concave boundary in front toward the middle lobe. Heart and mediastinum were displaced to the affected side and the thoracic wall retracted over the dense area. After 12 months bronchiectasis had clearly developed in several places within the consolidated right lower lobe and after another six months a large cavity had formed in the same lobe. The patient subsequently died in rapidly progressive pulmonary tuberculosis.

True epituberculosis, according to ELIASBERG-NEULAND, is on the other hand characterised by a decidedly good prognosis. The massive opacity gradually disappears either altogether, causing restitutio ad integrum, or most of it, leaving behind a few insignificant mottled and streakshaped partly calcified opacities. A usual condition of persisting nature is a moderate development of bronchiectasis.

Among the massive lobar or nearly lobar lung consolidations of chronic course occurring in children infected with tuberculosis one should thus distinguish between so-called epituberculosis, according to ELIASBERG-NEULAND, and obstructive atelectasis. These two conditions are entirely separate, each having its own roentgen appearance, clinical symptoms and morbid anatomy. Both conditions however are to be regarded as sequences to primary pulmonary tuberculosis in children. In some cases a combination of these two conditions may possibly occur, though under such circumstances one of them dominates over the other.

SUMMARY

Cases of so-called epituberculosis published in the literature can from patho-anatomical and radiological viewpoints be separated into two different conditions, one of which answers to a more or less widespread obstructive atelectasis and is caused by enlarged hilar glands which infiltrate and compress the bronchus leading to the dense region. The author describes a case of his own of that nature as also a few verified cases collected from the literature. The other condition which would seem to tally with the true form of epituberculosis according to ELIASBERG-NEULAND is caused by tuberculosis of chiefly proliferative type.

ZUSAMMENFASSUNG

Die in der Literatur veröffentlichten sogenannten Fälle von Epituberkulose können vom pathologisch-anatomischen und radiologischen Gesichtspunkte aus in zwei verschie-

dene Krankheitszustände eingeteilt werden. Der eine entspricht einer mehr oder weniger ausgedehnten obstruierenden Atelektase und wird durch vergrösserte Hilusdrüsen verursacht, welche den Bronchus, der die Verbindung in das verdunkelte Gebiet herstellt, infiltrieren und komprimieren. Der Verfasser berichtet über persönliche Beobachtungen eines Falles dieser Art sowie über einige den Veröffentlichungen der Literatur entnommene bestätigte Fälle dieser Erkrankung. Der andere Krankheitszustand, welcher nach ELIASBERG-NEULAND, mit der echten Epituberkulose übereinzustimmen scheint, wird durch eine Tuberkulose, welche hauptsächlichst proliferativer Natur ist, verursacht.

RÉSUMÉ

Les cas dits de épituberculose qui ont été publiés dans la littérature médicale peuvent être répartis au point de vue patho-anatomique et radiologique en deux sections différentes dont l'une correspond à un atélectasis obstructif plus ou moins étendu et est causée par l'agrandissement de glandes hilaires qui ont infiltré et comprimé la trachée-artère dans la région dense. L'auteur décrit un cas de cette nature qu'il a traité lui-même ainsi qu'un petit nombre de cas vérifiés recueillis dans la littérature. L'autre section qui semble correspondre à la forme véritable de l'épituberculose suivant ELIASBERG-NEULAND est causée par la tuberculose de type principalement prolifère.

FROM THE ROENTGEN DEPARTMENT OF THE SERAPHIMER HOSPITAL, STOCKHOLM, SWEDEN

ON OS NAVICULARE BIPARTITUM[1]

by

E. Lindgren

Os naviculare bipartitum is a debatable conception. The term would infer a bipartition of the scaphoid bone. Such a bipartititon however necessitates a development from more than one centre of ossification. On this point literary data are at variance. In one case HASSELWANDER observed two points of ossification, the size of pinheads, at a distance of a few millimetres of one another wherefore it was a case of »eine doppelte Ossifikationsknospe in einem einheitlichen Hof von grossblasigem Knorpel». As he is pointing out himself, however, »dieser Hof is das eigentliche Ossifikationszentrum». In another case, however, (a hypothyroid dwarf) he found on both sides two »unregelmässig geformte grössere Knochenkerne.» It would seem therefore that two ossification centres can occur in the scaphoid bone, at any rate in disseases leading to disturbances of the normal ossification. PFITZNER who has dealt more closely with the development of the scaphoid considered he had found a congenital naviculare bipartitum in 9 cases out of 1,456 wrist joints. WOLF and later also others have however subjected the conception naviculare bipartitum to critical examination and maintain that a bipartite scaphoid only occurs as a result of fracture, i. e. in pseudoarthrosis. The more and more extensive use of radiography has widened our knowledge and shown how common navicular fractures are and how easily in some cases they may be overlooked. Formerly, in particular, the frequency of pseudoarthrosis after fracture of the scaphoid was very great. There is no doubt that a number of cases earlier described in the literature are not to be considered as true naviculare bipartitum but of traumatic origin. On the basis of his experience of 800 hands anatomically and roentgenologically examined GRUMBACH (1921) has put forward the view that naviculare bipartitum is exclusi-

[1] Submitted for publication May 5, 1941.

vely of traumatic origin. KÖHLER with his wide experience of the roentgenology of the skeletal system says (1939) he has never seen a bipartite scaphoid on the radiogram. Yet he does not deny the possibility of its presence but considers »dass die Mehrzahl der Fälle von nav. bipartitum lediglich Pseudoarthrosen nach Frakturen sind». MC KENDRICH in his »medico-legal injuries» (London 1927) gives on the whole no mention at all of the possibility of a congenital naviculare bipartitum. In the course of recent years individual cases have been recorded from different quarters as congenital naviculare bipartitum: FAULKNER (no history of trauma), POKROWSKI (bilateral), BOYD. The latter's case was an autopsic finding and likewise bilateral, moreover on one side it was combined with an os centrale. In BOYD's case the scaphoid was divided at about the middle with the dividing line passing from the lateral border of the joint surface towards the radius to about the middle of the concavity for the head of the os magnum. There thus arose a bigger and a smaller portion, the former distally at the radial side articulating with the multangulum majus and minus, and the latter proximally at the ulnar side against the lunatum. The opposing surfaces were smooth and covered by a thin well defined cortical layer. ANDREESEN maintains he has definitely proved a congenital naviculare bipartitum to occur and adds: »nach weiterem Veröffentlichungen damit zu rechnen ist, dass diese Entwicklungsstörung nicht sehr selten ist». This is obviously however contradicted by a statement to the effect that it has never been observed by KÖHLER and must be due to misinterpretation of some cases of pseudoarthrosis. At any rate it is impossible with our present knowledge to regard straight away every bipartite scaphoid as a result of fracture. After perusal of the literature with examination of the pictures published there remains, however, undoubtedly a certain amount of scepticism against the majority of cases; yet to some extent this may be due to lack of free projection of the scaphoid in the radiographs concerned.

The question whether bipartite scaphoids occur or not is not only of theoretical interest. Roentgenologically the differential diagnosis is concerned with an old fracture with the formation of pseudoarthrosis. It is clear therefore that the question may be of importance for our therapeutic procedure and is also (perhaps of greater significance in these cases) of importance from the point of view of insurance. In order to enable a roentgenological assessment to be made of the condition it is necessary to have, besides the ordinary antero-posterior and lateral pictures, a separate view of the interspace between the two scaphoid portions to enable a reliable study to be made of the opposing surfaces — this would seem obvious enough but to judge from the literature it is very often overlooked.

Fig. 1.

Fig. 2.

I have been led to take up this problem by a case which to my mind really shows that a bipartite scaphoid can exist. It was the case of a young man, aged 19, who slipped on the ground and fell but he managed to ward off the fall with his hand against a wall. His wrist swelled up and when radiographed three weeks later he presented a picture as shown in fig. According to statement he had not earlier been exposed to any injury. In the radiographs there can be seen at the usual site of the scaphoid, two bones, a proximal one against the joint surface of the radius and a distal one mainly articulating against the multangulum majus. Between the two bones there is a space of 1—2 millimetres and both of them are surrounded by a thin zone of corticalis, even on the opposing surfaces. The bony structure in the two bones presents no signs of nutritive disturbances. About twelve months later the roentgen appearance had undergone no changes.

First of all this roentgen appearance cannot be caused by the injury stated. A scaphoid fracture of such recent date cannot assume that appearance. The fact that the picture had undergone no changes in the course of twelve months' observation also favours the same conclusion. Can the appearance be caused by an old fracture — a pseudoarthrosis? The patient's age (19 years) to some extent disfavours this presumption and the bone structure and the appearance of the surfaces are definitely against it. In pseudoarthrosis we get a gradual sclerosis of the opposing surfaces of the fragments but this sclerosis always becomes irregular. Its appearance is never so regular and of such uniform

thickness as a corticalis seam. Moreover we get as a rule distinct changes in the bony structure of the fragments which structure becomes irregular with vesicular rarefactions and sclerotic areas.

In the roentgen examination of wrists cases are not infrequently found where the scaphoid projects with a »peg», as it were, towards the capitatum and multangulum minus which depends upon fusion of the scaphoid and the os centrali carpi (THILENIUS, quot. by KÖHLER). Similar fusion may explain why in the present case the distal portion of the scaphoid strongly projects towards the centre of the wrist.

The possibility of diagnosing naviculare bipartitum in adults will be conditioned by the degree of arthrotic changes in the wrist. In proportion as irregular joint surfaces, deposits and structural changes arise in the wrist and also affect the scaphoid bone, to that extent the differential diagnosis between a congenital bipartite naviculare and pseudoarthrotis will become uncertain or impossible. In such cases one should bear in mind that the majority of these pictures are caused by a pseudoarthrosis and that a congenital bipartite naviculare is no doubt a rare anomaly.

For making a roentgenological diagnosis of naviculare bipartitum we must claim that the two bones at the site of the scaphoid shall have a normal bony structure and that the two opposing surfaces shall be bordered by a narrow zone of corticalis of normal appearance.

SUMMARY

The term naviculare bipartitum is discussed. Report of a case.

ZUSAMMENFASSUNG

Der Ausdruck naviculare bipartitum wird diskutiert. Bericht einem Fall.

RÉSUMÉ

Le terme naviculare bipartitum est discuté. Relation d'un cas.

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(CHIEF: NILS WESTERMARK, M. D.)

ON DARKROOMS AND THEIR EQUIPMENT IN ROENTGEN DEPARTMENTS[1]

by

Nils Westermark

In Acta Rad. in 1928 LUNDQUIST gave a very good account of the planning and outfit of darkrooms in roentgen departments. Since then however further technical possibilities have been added and new experiences gained wherefore the question of darkrooms, so important for the planning and equipment of roentgen departments may again justify being taken up for discussion.

In the darkroom of a roentgen department various kinds of work have to be carried out, such as reloading of casettes, development, fixing, rinsing and drying films. Further there are special photographic tasks to be seen to in the darkroom, such as reduction and enlargement of radiograms, copying and making lantern slides. Finally in the darkroom the radiologist will have to inspect radiograms just taken and on the strength of these decide about the further examination of the patient. The radiologist should also be able to demonstrate the radiograms just taken and give a preliminary report to the doctor in charge of the patient on the result of the examination.

These various tasks justify dividing the darkroom into two units. In one of them all so-called darkroom work should be carried out, such as reloading of casettes, developing and fixing films. In the other unit the films should be rinsed and inspected. Thus the first unit should only have ordinary darkroom lighting while inspection of the films requires a strong light. Both units should be in communication with each other to enable the staff to move readily from one to the other. For that purpose either a passage can be made, 1 metre long and 0.80 metre wide, with close-fitting doors at each end, opening from the passage, or else a passage about 2 metres in length with screens put across in a way to permit a zig-zag

[1] Submitted for publication, Febr. 19, 1941.

passing. The passage should be at least 0.80 metre wide. The latter arrangement takes up a bit more space than the former.

The darkroom should be centrally placed in the department and be easily accessible from the different diagnostic laboratories. It is convenient therefore to arrange the darkroom with its two units between two larger diagnostic laboratories where most and the biggest examinations are carried out. The smaller laboratories for special work are best grouped on the other side a central corridor which separates the roentgen rooms and serves as a line of communication between these. By such grouping of the diagnostic laboratories and the darkroom this can without detriment to the work there serve 5—6 different diagnostic laboratories. If the roentgen department be situated on a floor between the surgical and out-patient departments, which seems to me a happy principle for roentgen departments in hospitals, the same darkroom can also serve diagnostic laboratories in these departments. The casettes can be transferred by lifts between the different floors. By an arrangement of that kind one and the same darkroom can serve 7—10 different laboratories and be readily accessible from them all. In bigger roentgen departments two or several darkroom units of that nature may be arranged. From the point of view of organisation, however, a certain category of patients should always be examined in one and the same diagnostic unit. A suitable division here is to reserve one diagnostic unit for the examination of in-patients, possibly only patients from certain wards, and to reserve a second or a third unit for out-patients only. In this way we can always know where a certain patient has been examined and where to look for the radiograms concerned.

The diagnostic laboratories next to the darkroom should be in direct communication with the darkroom by means of casette locks. Such locks should also be the means of communication between the other diagnostic laboratories and the darkroom by way of the corridor or some adjacent suitable place. Such locks can be partitioned off into different compartments, one for each laboratory.

Darkrooms as well washing and inspection rooms should be in telephone communication not only with the different diagnostic laboratories and the offices of the roentgen department, but also with the different departments of the hospital. It is further convenient to instal a dictaphone in the washing- and inspection rooms to enable a direct report to be given in urgent cases.

On account of spilling of chemicals and fluids during developing, fixing and washing, floors and walls should be so constructed as to withstand any harmful effect of that kind.

The floor should be made in isolated sections. A suitable isolation is obtained by putting three layers of asphalt felt on top of reinforced con-

Fig. 1.

crete, the asphalt felt extending up the wall for about 20 cm. The asphalt felt is best covered with a layer of acid-fast cement mortar and on top of this acid-fast slabs of e. g. Upsala-Ekeby make are suitably laid. Acid-fast cement should be used between the slabs. The acid-fast slabs and the cement mortar should extend up the wall for 10—15 cm. as a skirting. By such an arrangement the floor forms a sort of basin which is resistant to chemicals. Each room should be provided with a drain in the floor. This is conveniently made by taking up a hole, 30 cm. wide, in the floor, and isolating it by acid-fast asphalt outside the reinforced concrete. In this hole a stainless funnel with grating should be fitted, readily exchangeable in the event of damage. The drain-pipes should be strongly dimensioned and readily accessible from the room below for replacement in the case of damage.

The walls should be made of reinforced concrete and moreover lined with acid-fast asphalt, to a height of 1.80 m.

For developing, fixing and washing films, it is most convenient to make use of a system of tanks by which the extensive amount of work going on in the larger roentgen departments becomes simplified. It would also in the long run seem the most economical procedure. Spilling and splashing are much more reduced than by using dishes. In the development of films it is exceedingly important to use a developer of fairly constant temperature. For the purpose there are water-cooled double-tanks on the market. Such a device, however, is very expensive and has proved

Fig. 2.

less satisfactory in some departments. In my experience it is better to use unglazed acid-fast earthenware tanks. Such tanks of Höganäs' make are of excellent quality and much cheaper to procure than the above mentioned watercooled double-tanks. It is important to have the tanks unglazed since the temperature of the developer can then be kept constant by evaporation. For 12 months I have thus recorded the temperature of the developer 5 times a day in tanks of that kind put up at St. Görans Hospital. During this period the greatest difference in temperature of the developer amounted to 3° C. The maximum temperature recorded was 23° C and the lowest 20° C. During consecutive twentyfour hours the difference in temperature did not run up to more than 1° C. During the same period the room temperature recorded varied between 18° C, and 30° C.

The tanks should be supported on stainless angle-bars which in their turn are welded to stainless table-legs which also support the work-tables. By making the table-legs of stainless pipes with feet adjustable the level of the tanks can be altered and thus fitted to the tables.

The work-tables should be made of 1.5 mm. thick stainless plate. In order to protect the walls the tables should be extended as splashing boards along the walls to a height of at least 750 mm. To avoid as far as possible splashing into the room it is advisable also to arrange a splashing board round the edge of the table facing the room to a height of about 50 mm. As a suitable stainless plate that has proved resistant to chemicals may be mentioned Avesta stainless plate no. 832 S. All welding should be carried out as so-called electric seam- or point welding. The table top should enclose the tanks, extend beyond their upper edges and be bent over them on the inside of the tanks causing the stainless plate to form a rim over the tanks. Along this rim a drop protector should be arranged to prevent fluid forcing its way up between the plate and the tank. A simple way of doing this is to weld a narrow stainless edge along the rim.

Between the developing and washing rooms there should be one or two wet locks through which films just developed and fixed can be sent out to the washing room. These locks should also be made of stainless-plate with electrically welded seams and provided with lids with automatic closing device preventing simultaneous opening of the different lids in the different rooms. The dimensions of these wet locks should be at least 550 mm. in width and 1,000 mm. in length. On the washing room side these wet locks may be partitioned off into different compartments by stainless plates. In this way it is easy to keep the inspected films separated from those not yet inspected and to complete the fixing before washing takes place.

The different tanks should be drained through easily exchangeable copper pipes led to the main drain in the floor. Taps in the tanks for development and fixation should be made of ebony as being resistant to the different chemicals. They also have the advantage of being inexpensive and readily exchanged if damaged.

Warm as well as cold water must be available in the rooms for developing and washing. The inlets should be drawn from the flats above and taken down in the walls between the developing and washing rooms. The shaft for these water pipes should be isolated by acid-fast asphalt. The pipes should be taken into the room underneath the work-tables in a direction from above downwards and immediately below the intakes be provided with drop protector. By arranging it in this way we prevent the chemical solutions that may adhere to the pipes from forcing their way into the wall causing its deterioration; this may easily happen if the pipes are taken into the room from the flat below. These inflow pipes lead to a mixer which should be placed under the table. By connecting a tube to this mixer all the tanks can be supplied with water. This tube connection can also be used for clensing floor and walls. It is best not

to have any taps or pipes above the table as these then become damaged by the chemicals which even through the pipes can force their way under the tables and into the wall.

Above the splash board in the washing room which may be lower than that in the developing room it is useful to put up a frosty glass plate of Opaxit make. When lighted this glass plate offers an excellent background for the inspection of films. This glass plate is also resistant to the chemicals and can therefore serve as a splash board. It is also easy to clean.

In the washing room the drying cupboard should be readily accessible. This can also be conveniently made of stainless steel. The air should be drawn off by ventilators to prevent increased dampness in the room which will be the result if the air from the drying cupboard is brought out into the room. Heating of the drying cupboard can be made electrically be means of a thermoregulator which prevents excessive heating.

On account of the great humidity produced in both rooms the air conditioning should be the best possible from a hygienic as well as technical point of view. The best and most efficacious air conditioning is obtained by a direct and large light-proof air shaft to the developing room. This room should therefore be lying close by an outer wall. This is also of advantage by allowing direct ventilation through the window. For modifying the temperature of the fresh incoming air it is convenient to have immediately below the air-intake a steam radiator. By various valve devices the air can be made to pass this radiator wholly or in part or else be taken directly into the room. In this way the fresh air can be suitably warmed. With the cold winter climate we have to reckon with in Sweden it is necessary to use a super-pressure steam radiator. If not we run the risk of getting the water frozen in the radiator. The air intake should be placed on the opposite wall by the ceiling and have a direct shaft to the outside air. In this shaft it is well worth to put in a suction ventilator. By such direct ventilation we obtain a dry and tempered air in the developing room. This is of great importance hygienically for the staff who is working there but also technically for the tank evaporation, so necessary for keeping the developer at a uniform temperature.

At the roentgen department of St. Görans Hospital the darkroom was rebuilt and fitted out in 1937 in accordance with the above principles as formed in the light of earlier experiences. This rebuilding and installation have proved well up to expectations. After a run of 3 years it has withstood any injurious action by chemicals and no defect has been noticed either to the building or the installation. Nor has it been necessary to carry out any repairs or renewal. The darkroom has also proved to satisfy the claims of hygiene.

SUMMARY

The author gives an account of how to plan a darkroom in a roentgen department and describes its position, building, construction and ventilation and also the arrangement and construction of tanks, work-tables, water inlets and drains. Tanks should be made of porous earthenware as these are inexpensive and have proved to keep the developer at a uniform temperature even during much variation in the room temperature.

ZUSAMMENFASSUNG

Bericht über die Art wie die Dunkelkammer einer Röntgenabteilung angelegt werden soll, Beschreibung der Lage, der baulichen-, Konstruktions- und Ventilationsanlagen, der Aufstellung und Konstruktion der Wasserbehälter, der Arbeitstische, der Wasserzu- und Abflussröhren. Irdene Wasserbehälter sind ihrer Billigkeit wegen empfehlenswert und auch weil sie erfahrungsgemäss, selbst bei starken Schwankungen der Zimmertemperatur, die Temperatur des Entwicklers auf gleicher Höhe halten.

RÉSUMÉ

L'auteur donne un aperçu de la manière de disposer une chambre noire dans un service roentgen et décrit son emplacement, sa construction, son organisation et sa ventilation. Il en fait de même pour l'organisation et la construction des caisses de développement des tables de travail, de distribution et d'écoulement d'eau. Les caisses de développement doivent être de faience poreuse du fait qu'ils seront peu coûteux et permettront de maintenir les révélateurs à une température uniforme même pendant de grandes variations dans la température de la chambre.

FROM THE RÖNTGEN LABORATORY OF THE UNIVERSITY OF AMSTERDAM (DIRECTOR: PROF. DR. J. VAN EBBENHORST TENGBERGEN) AND THE CONSULTING BUREAU ON RHEUMATIC DISEASES, AMSTERDAM (DIRECTOR: J. VAN BREEMEN)

RESULTS OF RÖNTGEN TREATMENT OF SPONDYLOSIS RHIZOMELICA (SPONDYLARTHRITIS ANKYLOPOETICA)[1]

by

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and

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To the already considerable number of therapeutical measures applied in the treatment of this affection, which is so resistent to every form of treatment (e. g. application of heat, ultraviolet light, medicaments such as goldsalts, pyramidon and other pharmaca; vaccin-treatment, massage, exercises etc.) roentgen treatment has been added during the last 10—12 years (ALTSCHUL) (1). Although most of the authors who occupied themselves with this form of treatment obtained favourable results, especially concerning decrease of the pains, which — with the progressive stiffening of the vertebral column — is one of the most troublesome symptoms of this disease (KAHLMETER, (2) SNYDER, (3) KERSLEY, (4) KÜHLMANN (5)), it is remarkable that only few publications appeared, containing an exact review of a more or less extensive number of patients, treated with this form of therapy. Truly TOUW (6) mentioned favourable results in general after röntgen treatment. Not only the pains diminished in all cases but also such stiffness of the spinal column and the thorax as was the result of reflectory muscle spasm and not of bony ankylosis. The general condition also improved, whereas the sedimentation rate sank. Also GRABOWSKI (7) is of the opinion that in the cases where stiffness ("brettharte Steifigkeit") is the consequence of reflectory spasm, very good success may be obtained in the function of the spine.

Of the investigators who gave more exact facts about their material HAENISCH (8) is first to be mentioned. He treated 13, mostly serious,

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patients. 10 of these showed marked improvement. In some cases also the function of the spinal column improved. The ankylosing process, however, proceeded, perhaps slower than without treatment. KEMEN (9) treated 77 cases, 67 of which responsed well. Examined afterwards the function appeared to be reasonable. The thoracic respiration excursion (difference between the circumferences of the thorax measured over the nipples, during extreme inspiration and expiration) even came to 5—10 cm. The radiograms taken before and after treatment showed neither disappearance of the ossification of the ligaments, nor improvement of the small intervertebral and sacroileac joints, as might have been expected. It seemed that in some vertebrae the amount of calcium had increased somewhat. 28 of 29 patients followed up during a longer time, were able to continue their daily work e. g. as bricklayer, blacksmith, carpenter, locksmith etc. The roentgen treatment was supported by massage and exercises.

In our country QUARTERO (10) published his experience of 11 patients. Also he obtained very good results. In a few cases the function of the spine improved, the stiffness became distinctly less; in one patient who had been stiff since 7 years the improvement was very evident.

With these hopeful data in mind we have also started to treat a number of our patients with röntgen therapy. Although this disease occurs relatively seldom and many general practitioners will see only a few patients suffering from it during their whole practice, every year at our consulting bureau an average of 15 cases of spondylosis rhizomelica are seen among the nearly 5,000 sufferers who seek relief for rheumatic illness. The clinical course of the affection will not be discussed here.

In the well defined cases the diagnosis is easily and mostly made at first sight. The peculiar attitude with the often serious kyphosis of the thoracic part of the spine, the flat back, being the result of the disappearance of the lumbar lordosis, the strongly limited thoracic excursion during respiration, the formation of a skinfold across the abdomen, the atrophy of the long muscles of the back (erector trunci), all being the consequence of the progressive and often total stiffening of the spinal column, lead us to the correct diagnosis. Evaluation of the diagnosis can be more difficult in the first stadium of the disease when all these symptoms as yet are not present or only to a lesser degree. Nevertheless, also in these circumstances the evaluation of the diagnosis is nearly always possible. First of all an extensive examination of the functions of the spine, by which slight deviations from the normal function can be detected, is necessary for this. When doubt arises we have two further symptoms upon which we can rely with great

certainty. As described by FISCHER (11), VONTZ-KREBS (12), SCOTT (13), FORESTIER (14) and others, already in very early stadia of the disease involvement of the sacroileac joints can be detected by röntgenological examination, consisting of a narrowing of the articular space, leading to total disappearance hereof, so that the articulations cannot be seen. Often a slight, sometimes a more pronounced, osteoporosis can be seen in this region. Röntgenological alterations of the spinal column itself are generally not seen at the beginning. This is a very constant symptom which did not fail to be present in any of our patients. In some cases several years can pass before clinical signs are apparent. Sometimes a slight atrophy of the vertebrae is already present at this time.

In uncertain cases röntgenological examination of the sacroileac joints should not be omitted, when a patient who looks ill, sweats much, loses weight, and does not quickly respond to treatment, complains of persistent pains of sciatic nature irradiating to the legs, sometimes also to the arms, and of low back pain.

A second important symptom is the mostly considerable acceleration of the sedimentation rate.

In differential-diagnosis we have to consider osteoarthrosis deformans of the spine (spondylarthrosis deformans, gardeners spine) besides several easily detected affections of the spinal column, such as spondylitis tuberculosa, metastatic carcinoma, adolescent kyphosis, luxation, fracture etc.

Spondylosis deformans mostly occurs at a higher age in people who have done very hard work during their life. The function of the spine is less limited than in spondylosis rhizomelica, pains are less pronounced, the sedimentation rate is not at all or only moderately accelerated and the sacro-iliac joints remain intact, all this apart from the röntgenological aspect of the columna vertebralis itself which has a quite different character. The formation of a bamboo-spine as a result of ossification of the ligaments does not occur in true spondylarthrosis deformans, osteoporosis is generally not so prominent, and as a contrast hereto new-formation of bone is seen in the form of the so called "becs de perroquet", bony appositions on the corpora of the vertebrae. In both affections the small intervertebral joints may be involved.

It is important to mention here the fact that mixed forms of these two diseases occur, which may be readily detected by röntgen examination. Apart from the characteristic symptoms of spondylosis rhizomelica, e. g. involvement of the sacro-iliac joints and ossification of the ligaments, new-formation of bone (becs de perroquet) at the corpora of the vertebrae is present. In our material three such cases have been observed (cases number 8, 21 and 25).

Fig. 1. Affection of the sacro-iliac joints only.

Altogether we have treated 27 patients with röntgen therapy. Clinically as well as röntgenologically the diagnosis of these cases was well established. For the greater part they were classic, far advanced cases. They were all men. In two patients tuberculosis, in three gonorrhoe was present in the clinical history. Three patients had gone through a luetic infection, one patient had suffered from an iritis, and one from rheumatic fever, with involvement of the heart. In all cases the function of the spine was impaired, in 9 patients no movement was possible anymore. In 22 patients the thoracic excursion during respiration was distinctly limited. In 24 patients the sedimentation rate was considerably accelerated. Röntgenologically the sacro-iliac joints were affected in all cases. In 19 patients the small intervertebral joints were affected also, whereas in 15 ankylosis was present as a result of ossification of

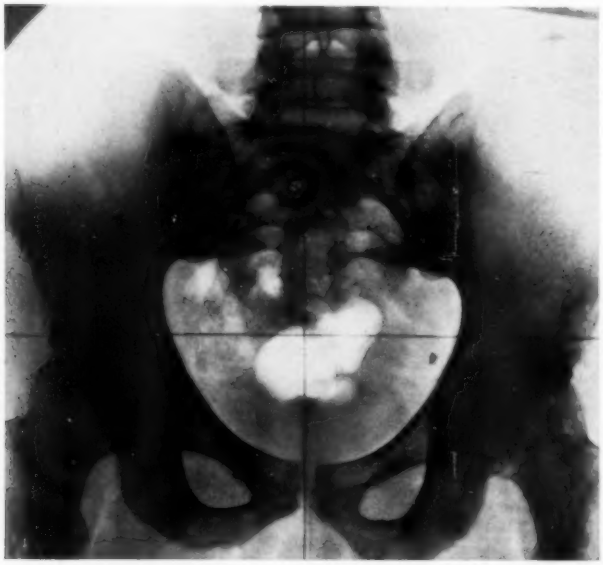

Fig. 2. Affection of the sacro-iliac joints as well as of the hips.

the ligaments. Not always the process involved the whole of the spinal column. In some cases only the lumbar, thoracic, or cervical region was involved. Only three patients had a definite bamboo (case numbers 4, 10 and 26).

The large joints (especially the hips) were involved in three cases (numbers 6, 11, 18). Sometimes (cases 2, 3, 7, 9 and 11) the sacro-iliac joints had disapperaed as the only röntgenologic evidence of the disease. On the enclosed röntgen pictures some of these possibilities may be seen.

Only three patients showed the above mentioned mixed form of osteoarthrosis and spondylosis rhizomelica.

The age of the patients varied from 19—50 years; 1 patient was 19 years old, 10 between 20 and 30, 10 between 30 and 40, and 6 between 40 and 50 years at the time of treatment. The greater part had already had their complaints during a long time. Even in our days diagnosis is generally made too late, a fact to which LASSEN (15) called attention in a recent publication. The average time after which the diagnosis was established in this material, was 6 years after the onset of the complaints. In 9 of our cases the complaints existed less than one year; in 5 less than three years; 2 patients had already had their complaints

3—5 years and finally 11 patients suffered during a longer time, one of them 16 years. Most of our patients were sent to the consultation bureau with the diagnosis "sciatica" or "lumbago". In practically no case had the general practitioner recognised the serious condition. In our opinion this is a regrettable fact, since early treatment can give much relief to patients suffering from this serious disease, showing indeed spontaneous remissions, but always progressive. By early treatment it would perhaps be possible to avert an often occurring total invalidity.

All patients have been treated under the supervision of one of us (professor J. VAN EBBENHORST TENGBERGEN) in the Röntgen laboratory of the University of Amsterdam. Before röntgen treatment was induced, some form of physical therapy had been applied to all of them. Sometimes injections had also been given with the vaccine of WARREN-CROWE, mostly without much beneficial effect.

The röntgen therapy was applied so that the programme of irradiation was adapted to the complaints of the patients. The columna vertebralis was divided into four fields (I, II, III, IV), three lengthwise, the topmost field also including the medulla oblongata, and one field across below, with the sacro-ileac joints lying in the radiation cone.

Fig. 3. Bamboo-spine in connection wich symptoms of arthrosis deformans.

Radiation was given with 180 K.V. and 0.8 Cu filter. Mostly 200 r. was given each time to as many fields as necessary, two days interval between each session. This quantity was given three times, with 14 days interval between each course.

After in interval of six weeks a second, later on in some cases a third course was given.

If necessary the involved large joints were irradiated apart.

After the publication of QUARTERO we tried to irradiate only the cervical medulla to see whether this method had a special influence on the course of the disease. This did not seem to be the case. In the following table (I) the total quantity of r given to each field is given for every patient.

Table 1

Case no.	r. on field I	r. on field II	r. on field III	r. on field IV	r. on the hips	r. in total	Date of last irradiation
1	600	400	400			1 400	2—'40
2	900	400	400	400		2 100	1—'40
3	500					500	6—'39
4	900	400	400			1 700	2—'39
5	1 300	400	700			2 400	5—'39
6	1 000	500	500		800	2 800	7—'39
7		400	400	400		1 200	4—'39
8	900	500				1 400	2—'39
9	800	300	300			1 400	3—'39
10	600	600		600		1 800	5—'40
11	900	200	200		200	1 500	9—'39
12	900	900	500		(l. hip)	2 300	2—'39
13	400	400	400			1 200	5—'38
14	100	100				200	5—'38
15	900					900	5—'39
16	600	600	600			1 800	10—'38
17	1 000					1 000	4—'39
18	600	300	300	300	400	1 900	5—'40
19	900				(r. hip)	900	6—'39
20		400	400	400		1 200	1—'39
21	600					600	6—'39
22		200	300	300		800	8—'38
23	600	600	600	600		2 400	2—'39
24	750	200	200	500		1 650	6—'39
25	600	600	500			1 700	2—'39
26	700	400	400			1 500	4—'39
27	800	300	300			1 400	2—'39

Results of Treatment

In discussing the results we shall divide the clinical material into 4 groups according to the time during which the patients suffered from their complaints.

First group. Complaints existing less than one year.

This group contains 9 patients. As is readily understood these patients were in the first stadium of their disease. All except one had a highly accelerated sedimentation rate. On the röntgen pictures all showed affected sacro-iliac joints, in 4 cases the intervertebral joints were involved also, only one patient showed ankylosis of the ligaments. One patient had the mixed form with arthrosis deformans. The clinical symptoms were evident in all cases in spite of the short duration of

the complaints, consisting of a limitation in the function of the spinal column. One patient had normal thoracic excursion.

Two patients did not fulfill our request to come for a reexamination. Of the remaining 7, 6 improved considerably in regard to the subjective symptoms, one patient showing only slight improvement. In three cases the function of the spine was better after treatment. These three had nearly normal thoracic excursions after treatment (4—7 cm.) These 7 patients remained able to continue their daily work e. g. as cardriver, shopkeeper, salesman, cook, workman, etc. The sedimentation rate sank in 5 cases mostly considerably, once to the normal value. In one patient this value was normal before and after treatment In one case the sedimentation rate rose after treatment. As a whole the results of the treatment in this series were good.

Second group. Complaints existing longer than one and shorter than three years.

5 patients belonged to this group. In three the sedimentation rate was considerably accelerated. One patient, a man of 50 years, had a normal value before treatment was induced. All showed affection of the sacro-iliac joints, 4 an easy detectable ankylosis of the ligaments and affection of the intervertebral joints. The thoracic excursions as well as the function of the spine were strongly limited in all cases of this series. Only one patient (case number 11) was still in a relatively good condition. It was a pity that he did not come to us for a re-examination. In this group only 2 patients obtained relief from their pains as a result of the treatment. One patient noticed a slight success, whereas one told us that he had observed an infavourable influence.

This patient (case number 14) was in a deplorable condition, with a total ankylosis of both hips and of the spinal column in toto, in a highly kyphotic state. The ankylosis of the hips was the principal cause of his invalidity.

He hardly could walk or stand at all. He had no thoracic excursion anymore. He was hospitalised several times, but no form of treatment was able to influence his condition. The sedimentation rate however sank from 70 mm. to 19 mm.

In only one patient (case number 13) the function of the spine improved. He was the only one who remained able to continue his work as a clerk in an office.

The sedimentation rate sank in three patients, in two it was more elevated after treatment than before. In comparison with the first group, the results in this series were distinctly worse.

Table II

Time of existence of the complaints	Number	Age	Profession	Röntgen examination					Sedi
				Sacroiliac joints involved	Inter-vertebral joints involved	Ankylosis of the ligaments	Bamboo formation	Becs de Perroquet	befor treat ment
Less than one year 1st group	1	24 y.	employé	+	+	—	—	—	102
	2	21 y.	office clerk	+	—	—	—	—	5
	3	31 y.	carpenter	+		—	—	—	66
	4	39 y.	car-driver	+	+	+	+	—	18
	5	29 y.	cook	+	+	—	—	—	29
	6	24 y.	ware house man . .	+	+	—	—	—	38
	7	46 y.	shop-keeper	+	—	—	—	—	38
	8	50 y.	sales manager . . .	+	+	—	—	+	47
	9	19 y.	workman	+	—	—	—	—	53
1—3 years 2nd group	10	50 y.	merchant	+	+	+	+	—	4
	11	24 y.	office clerk	+		—	—	—	5
	12	44 y.	tramway-driver . . .	+	+	+	—	—	74
	13	29 y.	office-clerk	+	+	+	—	—	40
	14	26 y.	office-clerk	+	+	+	—	—	70
3—5 years 3d group	15	35 y.	sales manager . . .	+	±	+	—	—	28
	16	22 y.	mechanic	+	+	+	—	—	35
More than 5 years 4th group	17	35 y.	student	+	+	—	—	—	22
	18	30 y.	?	+	+	—	—	—	46
	19	30 y.	cook (seaman) . . .	+	+	+	—	—	15
	20	41 y.	porter	+	+	—	—	—	24
	21	39 y.	mechanic	+	+	+	—	+	20
	22	35 y.	road-worker	+	+	+	—	—	66
	23	37 y.	letter carier	+	+	+	—	—	36
	24	37 7.	ware house man . .	+	+	+	—	—	47
	25	43 y.	workman	+	+	+	—	+	16
	26	40 y.	seaman	+	+	+	+	—	50
	27	36 y.	cook	+	+	+	—	—	30

Third group. Complaints existing from 3—5 years.

The two patients who belonged to this group stopped treatment on their own account, nor did they come for a re-examination, so that any further comment concerning these cases can be dispensed with.

Fourth group. Complaints being present during a time longer than 5 years.

Table II

Sedimentation rate		Clinical condition after treatment			Breathing excursion		Results of treatment		Remarks
before treatment	after treatment	able to work	stiffness decreased	pain decreased	before treatment	after treatment	subjective	objective	
102	18	yes	yes	yes	3 cm	5 cm	good	good	re-examination
5	5	yes	yes	yes	6 cm	6 cm	good	good	» »
66	?	no	?	?	3 cm	3 cm	?		no re-examination
18	12	yes	no	yes	3 cm	3 cm	good	stat.	re-examination
29	20	yes	no	yes	3 cm	? cm	good	stat.	» »
38	?	no	?	?	2 cm	? cm	?	?	no re-examination
38	4	yes	yes	yes	3 cm	4½ cm	good	good	re-examination
47	17	yes	no	yes	1 cm	1 cm	moderate	stat.	» »
53	14	yes	no	±	2 cm	2 cm	good	stat.	» »
4	63	no	no	no	1 cm		no result	stat.	re-examination
5	15	no	no	yes	6 cm		good	stat.	no re-examination
74	33	no	no	yes	2 cm	2 cm	moderate	stat.	re-examination
40	20	yes	yes	yes	1½ cm	5 cm	good	good	» »
70	19	no	no	no	0 cm	0 cm	bad	stat.	» »
28	16	?	?	?	5 cm		good	stat.	no re-examination
35	?	?	?	?	1 cm		?	?	» » »
22	?	no	?	?	1 cm	? cm	?	?	no re-examination
46	?	?	?	?	?	? cm	?	?	» » »
15	10	yes	no	yes	1 cm	3½ cm	good	moderate	re-examination
24	12	yes	no	yes	2 cm	2 cm	good		» »
20	8	yes	no	yes	3 cm	3 cm	no result		» »
66	38	yes	no	yes	1 cm	1 cm	good		» »
36	22	yes	no	yes	1–2 cm	2–3 cm	good		» »
47	17	yes	no	yes	2 cm	5 cm	good		no re-examination
16	—	?	?	?	2 cm	? cm	?		» » »
50	13	yes	no	yes	1 cm	1 cm	good		re-examination
30	20	?	no	?	0 cm	? cm	good		no re-examination

The 11 patients belonging to this group had all affected sacro-iliac joints, in 9 of them also the intervertebral joints were affected. In two a mixed form of osteo-arthrosis and spondylosis rhizomelica was seen; 8 patients of this series had ankylosis of the ligaments. Definite bamboo formation was present in one. All had a stiff spine and limited thoracic excursions. The sedimentation rate was elevated in all of them.

Two patients were not able to undergo re-examination because of their residence in a foreign country, one withdrew from re-examination. From the remaining 8, 7 noticed a more or less pronounced relief of their pains, 5 remained able to continue their work e. g. as cook, porter, mechanic, road worker, letter carrier. No improvement of function was seen in any of them. The thoracic excursions, in all cases limited, improved only in one case (number 19). The well known fact that many of these sufferers remain able to continue their work, in spite of a totally stiffened spine, if they only have no pain, is confirmed once again in this series. Remarkable in this respect is the story of case number 19 who was in military service as a seaman during the recent war. The result of the röntgen treatment had been very good. Although his spine was very stiff, he had been able to fight during the battles without any discomfort as he declared.

Of the greatest importance in connection with the problem of validity is the position in which stiffening of the spine occurs. Far advanced kyphosis gives a bad chance; a normal, as far as possible erect position, a much better one. To these patients who are naturally indolent about these things and all to much inclined to give away to the disposition of forming a progressive kyphosis it is therefore always very necessary to insist with great stress on regular daily exercises, walking erect and lying in bed with a hard mattress with only a little cushion under the head and no cushion under the knees. Often these measures give rise to more pain. The obvious sedative action which röntgen treatment unfolds makes it easier for the patients to follow our advice, and has also a good influence in this way.

In all these far advanced cases the sedimentation rate decreased after the treatment. In our opinion the results obtained in this series may be called very favourable.

On the above table (II) the facts given in the above mentioned review are arranged once more. To summarize, it appears that from these 27 patients 16 showed an evident and 2 a moderate subjective improvement. 15 were able to continue their daily work. Only in 4 patients the function of the spinal column improved. The sedimentation rate sank in 18 cases. If we may consider this symptom as an index of activity of the process, we may say that in 18 cases the activity of the disease was subdued; in our opinion a very good result.

Unwanted complications as a result of the treatment hardly occurred. Now and then a slight röntgen disease was seen, and the patients complained of headaches and nausea. More often a slight depreciation of the leucocyte count was observed, which however was transient and of little importance.

If the obtained results will be of a standing nature and to what degree we have succeeded in impending the progress of the disease and thereby saving the patients from a later invalidity, the future will show. The observation time of two years at its most is much to short for this.

In conclusion we hold ourselves justified in saying that the results of röntgen treatment are favourable and that this form of therapy is an improvement in the treatment of this serious disease which strikes the patients in the best period of their life and leads so often to complete invalidity. But for all that this form of treatment does not justify in giving way to excessive optimism.

SUMMARY

After a short review of the literature, some remarks about the diagnosis and the differential-diagnosis of spondylosis rhizomelica are made. Some technical data concerning the application of röntgen treatment to 27 patients are given. After this the therapeutical results are mentioned. The patients are divided into four groups according to the time during which they had been suffering from their complaints. The best results have been obtained in patients whose complaints existed only a short time (less than one year). Of the 27 patients treated in this way, 18 improved more or less, 15 were able to continue their daily work after treatment. Only in 4 cases the function of the spine improved; in 18 cases the sedimentation rate sank, in 8 to values lower than 15 mm. during the first hour (WESTERGREN). Altogether the results may be called favourable.

ZUSAMMENFASSUNG

Verff. geben eine gedrängte Literaturübersicht und besprechen kurz die Diagnose und Differenzialdiagnose von Spondylosis rhizomelica. Es werden einige die Röntgenbehandlung von 27 Patienten betreffende technische Daten angeführt sowie auch therapeutische Resultate. Die Patienten werden, je nach der Dauer der Beschwerden, in 4 Gruppen eingeteilt. Die besten Resultate wurden bei Patienten erzielt, die noch nicht lange über Beschwerden klagten, (kürzer als 1 Jahr). Von den 27 Patienten, welche auf diese Weise behandelt worden waren, besserte sich der Zustand mehr oder weniger bei 18, 15 konnten nach der Behandlung ihrer täglichen Arbeit wieder nachgehen. Die Funktion der Wirbelsäule besserte sich nur bei 4 Fällen; bei 18 Fällen verringerte sich die Senkungsgeschwindigkeit, und zwar bei 8 Fällen auf geringere Werte als 15 mm innerhalb der ersten Stunde (WESTERGREN). Im allgemeinen kann man die Ergebnisse als günstig bezeichnen.

RÉSUMÉ

Après une courte revue de littérature médicale, l'auteur fait quelques remarques touchant le diagnostic et le diagnostic différentiel de la spondylose rhizomélique. Il donne quelques données techniques sur l'application du traitement roentgen à 27 malades. Il mentionne les résultats thérapeutiques obtenus. Les malades ont été divisés en quatre groupes suivant le temps pendant lequel ils ont souffert de cette maladie. Les meilleurs résultats on été obtenus pour les malades qui n'ont souffert que peu de temps, moins

d'une année. Sur les 27 malades traités de cette manière, 18 ont été plus ou moins soulagés et 15 ont été capables de continuer leur travail journalier après le traitement. Le fonctionnement de la colonne vertébrale n'a été amélioré que dans 4 cas. Dans 18 cas, la sédimentation a baissé, dans 8 cas, elle a été inférieure à 15 mm pendant la première heure (WESTERGREN). Dans l'ensemble, les résultats peuvent être considérés comme favorables.

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